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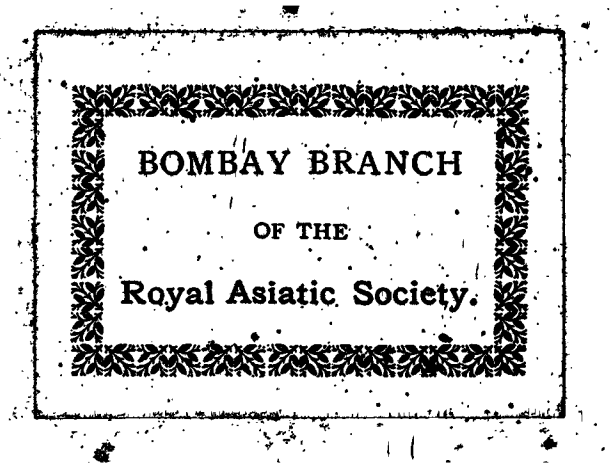

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REPORT

ON

SANITARY MEASURES IN INDIA IN 1889-90:

to 1892-93

VOL. XXIII.

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J. A GODLEY,

Under Secretary of State.

India Office,
11th September 1891.

REPORT.

I.—EUROPEAN ARMY.

The present Report on Sanitary Measures in India during the year 1889 is prepared for presentation to Parliament. It contains chapters on the health of the European and Native Troops, on the health of prisoners in jails, and on the health of the general population; it also contains chapters on vaccination, on medical institutions, including medical schools and lunatic asylums, and a chapter on sanitary works. Appended to the Report are abstracts of reports by the three principal Sanitary Commissioners in India, and memoranda by the Army Sanitary Commission in England reviewing the several Sanitary Reports for India.

Sickness and mortality, 1889.

The health statistics of the European troops on service in India during 1889 compare unfavourably with those of the previous year. Of an average strength of 69,266, the admissions into hospital were in the ratio of 1,498 per 1,000 against 1,382 in 1888, the daily sick-rate was 86 or 15 per 1,000 more, and the death-rate 16·60 against 14·84. The loss by invaliding was 26 per 1,000, or 3 per 1,000 more than in 1888, bringing the total loss by death and invaliding up to 43 per 1,000, an increase of 5 per 1,000 on the previous year.

The following statement shows the relative extent of sickness and mortality among European troops in the three Presidencies during 1889 and the previous year:—

Presidency.		Average Strength.	Ratio per 1,000 of Average Strength.				
			Admissions.	Daily Sick.	Deaths.	Invaliding.	Total loss.
Bengal	1888	42,858	1,398	71	15·47	20	36
	1889	42,821	1,517	87	16·07	24	40
Madras	1888	14,147*	1,341	77	15·55	28	43
	1889	13,619	1,507	90	20·05	30	50
Bombay	1888	11,882*	1,372	67	11·70	25	37
	1889	12,826	1,425	78	14·74	27	42
India	1888	68,887*	1,382	71	14·84	23	38
	1889	69,266	1,498	86	16·60	26	43

* Excluding troops in Burma for the first three months of the year.

It will be seen from the above statement that in all three armies the health of the troops in 1889 was not so good as in 1888. The chief causes of sickness were venereal diseases and ague, the former yielding a ratio of 482 per 1,000 against 371 in 1888, and the latter 334 per 1,000 against 316. More than half (54 per cent.) of the total sickness resulted from these two causes. Enteric fever, as usual, was the chief death cause, and was far more fatal than in the previous year, the death-rate having risen from 3·75 to 6·11 per 1,000. On the other hand cholera was much less prevalent, there being only 103 admissions in 1889 against 207 in 1888, and 78 deaths, equal to 1·13 per 1,000 against 137 or 1·99.

Bengal Army.

In the Bengal Army the admission-rate rose from 1,398 per 1,000 in 1888 to 1,517, the daily sick-rate increased from 71 to 87 per 1,000, and the death-rate from 15·47 to 16·07. Venereal diseases and ague were the chief causes of admission to hospital, contributing 32 and 21 per cent. respectively of the total sickness. The increase in the death-rate was mainly due to enteric fever, the mortality ratio from which was 6·68 per 1,000 against 4·15 in 1888. Under this one head alone 42 per cent. of the total deaths occurred.

Of the seven geographical groups into which the European Army of Bengal is divided, four returned a higher admission-rate than the average rate of the Presidency, viz., Agra and Central India group 1,869 per 1,000, the Punjab 1,678, Meerut and Rohilkund 1,653, and the Gangetic Provinces and Oudh 1,524. Of the other three groups the Bengal Proper group had an admission-rate of 1,465 per 1,000, the Hill

Stations 1,172, and Quetta district 1,1[illegible]ur of the seven groups rec[illegible] rates in excess of those of 1888. [illegible]verage death-rate of the [illegible] exceeded in four groups, and four returned higher ratios of mortality t[illegible] The increase was most marked in the Meerut and Rohilkund group th[illegible] of which rose from 11·89 per 1,000 to 18·73. Agra and Central India fol[illegible] 21·72, which was the highest death-rate of all the groups, against 17·61, th[illegible] with 18·51 against 16·25, and the Gangetic Provinces and Oudh with 17·32 against 15·01. In the Bengal Proper group the death-rate declined from 16·05 to 13·29, in the Hill Stations from 14·86 to 9·76, and in Quetta district from 13·50 to 9·95.

Of the garrisons in the Bengal Command, with a strength of over 1,000, seven returned higher death-rates than that of the Presidency, Meean Meer coming first with 47·49, followed by Bareilly 32·79, Ferozepore 21·93, Agra 21·60, Peshawar 20·80, Sialkot 17·54, and Rawal Pindi 16·72.

adras rmy.

Of the three Presidency Armies that of Madras was the most unhealthy, and all its ratios were much in excess of those of 1888. As in Bengal and Bombay venereal diseases and ague caused the majority of the admissions, the former yielding 30 per cent. of the total admissions, and the latter 24 per cent. Among the death causes enteric fever was the chief, contributing 22 per cent. of the total deaths. Respiratory diseases, cholera, and remittent fever were less fatal than in 1888.

Bombay Army.

In the Bombay Army also all the ratios were higher than in 1888, the daily sick-rate (78 per 1,000) being unusually high. Chief among the diseases causing increased admissions were venereal diseases, enteric fever, cholera, and malarial fevers, the first and last of which contributed 34 and 23 per cent. respectively of the total sickness. Of the deaths 40 per cent. resulted from enteric fever.

Of the five geographical groups of stations occupied by European troops of the Madras and Bombay Armies, the Rajputana, Malwa, Sind, and Aden group (average strength 5,814) recorded an admission-rate of 1,577 per 1,000 against 1,468 in 1888, and a death-rate of 20·47 against 13·34. Nearly half the mortality in this force resulted from enteric fever, the deaths from which rose from 22 or 3·76 per 1,000 to 55 or 9·46. In the Deccan and Nagpur group the ratio of admissions to hospital per 1,000 of an average strength of 9,506 was 1,286 against 1,232 in 1888, and the death-rate 14·20 against 9·19. The increased mortality was chiefly due to cholera, from which there were 19 deaths, giving a ratio of 2·00 per 1,000 against 6 or 0·63 in 1888. The Southern India group (average strength 3,935) recorded an admission-rate of 1,361 per 1,000 against 1,323 in 1888, and a death-rate of 10·71 against 9·00. Among the Madras and Bombay troops serving in Burma during 1889 (average strength 4,825) the admissions were in the proportion of 1,903 per 1,000 against 1,681 in 1888, and the death-rate 29·22 against 32·50. The greatest number of deaths in this force occurred from remittent fever (18 out of a total of 141), heat-stroke (14), cholera and hepatic abscess (12 each), and dysentery (11). The health of the troops stationed in the Hill Stations of Madras and Bombay was not quite so good as in 1888, the admission-rate having increased from 1,224 per 1,000 to 1,303, and the death-rate from 4·10 to 5·83. There were only seven deaths in this force with an average strength of 1,201, and three of these were from enteric fever against *nil* in the previous years.

Of the stations in Madras and Bombay, with a strength of over 1,000, only two returned death-rates higher than those of the Presidencies, viz., Secunderabad 30·45 against 11·54 in 1888, and Mhow 26·84 against 7·11.

Cholera.

Of the chief diseases, cholera was not so prevalent among the European troops in India in 1889 as in the previous year. The admissions to hospital from the disease numbered 103, equal to 1·5 per 1,000 of average strength, and the deaths 78 or 1·13 per 1,000 against 207 or 3·0 per 1,000 and 137 or 1·99 respectively in 1888. Among the troops in the Bengal Army there were 47 cases of cholera with 36 deaths, the latter being in the ratio of 0·84 per 1,000 of strength against 90 deaths, or 2·10 in 1888. All the seven groups of stations in this Command were affected by the disease. Of the total 36 deaths, 13 occurred at the single station of Meean Meer.

In the Madras Army there were 30 cases of cholera and 25 deaths, equal to 1·84 per 1,000 of strength. Twelve of the 25 deaths occurred at Secunderabad Station and seven among the troops marching to the Chin Expedition. In the Bombay Army the admissions to hospital from cholera rose from 10 to 26, and the deaths from 10 or 0·59 per 1,000 to 17 or 1·33. Nine of the deaths occurred among the troops stationed at Neemuch.

Among the whole of the European troops in India there were during the year under notice 153 cases of small-pox, of which 17 were fatal, as compared with 141 cases and 10 deaths in 1888. Eight of the deaths occurred in the Bengal Army, 6 in the Madras, and 3 in the Bombay Armies.

From intermittent fever the admissions to hospital among the European troops in 1889 were in the ratio of 334 per 1,000 of strength against 316 in the previous year. The deaths under this head numbered 13, an increase of two on the mortality of 1888. Only in Madras was the death-rate greater than in 1888, which was due to the inclusion of the statistics of Upper Burma, the Burma group of stations being the most malarious.

From enteric fever the admissions increased from 938 or 13·6 per 1,000 of strength to 1,584 or 22·9, and the deaths from 258 or 3·75 per 1,000 to 423 or 6·11. The Bengal Army recorded a death-rate under this head of 6·68 per 1,000 against 4·15 in 1888, the Madras Army 4·48 against 2·26, and the Bombay Army 5·93 against 4·04. As usual, young and unacclimatised soldiers were the chief sufferers, those under 25 years of age yielding a death-rate of 9·81 per 1,000 against 5·46 in 1888, while among men between 25 and 29, and from 30 to 34, the mortality was 3·25 and 1·83 per 1,000 respectively. Among men of less than two years' residence in India the death-rate rose from 6·39 to 11·65 per 1,000, among men of three to five years' 4·20 against 2 and among troops of from six to ten years' 2·43 against 1·08. In his report for year under notice the Sanitary Commissioner with the Government of India, Dr. says: "The beginning has been made of an important advance in the investig " of the pathology of the enteric fever of India. Through the kindness of Brig " Surgeon Hamilton, Surgeon-Major Knox, and Surgeon McGill, specimens of sp " and mesenteric glands from two cases were forwarded to a distinguished bact " logist, Professor Bernchard Fischer, of Kiel, Germany, who reports that he fo " the *bacillus typhosus* in all the specimens. As the chief bacteriologists of Eur " agree that the bacillus occurs in all cases of enteric fever, and never in ot " diseases, the conclusion is now absolutely certain that at least some of the fa " fevers of India with intestinal lesions are identical with the enteric feve " Europe. . . . The constant association of the bacillus with the disease makes " but certain, in the opinion of the most able bacteriologists of Europe, that the ba " is there the cause of the disease. If this be so in Europe, it must be also in I " Hence the source of *real* enteric fever in India must be looked for in the contamin " of ingesta, and climate must be considered but a secondary influence."

The admissions from dysentery and diarrhœa among the European troops we the proportion of 66 per 1,000 of strength or 1 per 1,000 more than in 1888, an death-rate 0·90 against 0·74. From both causes all three armies suffered more in than in the previous year, but Madras as usual recorded the highest death-rate.

More than a fourth (33,353 or 32 per cent.) of the admissions to hospital were venereal diseases, and the ratio per 1,000 of strength rose from 371 in 1888 to 481. increase was contributed to by all three armies. In Bengal the admission-rate ros 373 to 491 per 1,000, in Madras from 376 to 452, and in Bombay from 357 to 48

The loss to the whole army by invaliding during 1889 amounted to 1,789 equal to 25·92 per 1,000, against 1,557 or 22·71 in 1887. The proporti invalids to strength was as usual least in Bengal (24·23 per 1,000) and higi Madras (30·34), that of Bombay being 26·83; but in all three armies the exceeded those of the previous year. The percentage of troops invalided as u further service was 37 or 2 per cent. less than in 1888. As regards the influ age and length of residence in India upon invaliding, 50·06 per cent. of the were under 25 years of age, against 46·58 in 1888, while 29 per cent. of th number invalided were of less than two years' service and 82 per cent. were than five years' service. In the European Army as a whole 78 per cent. of t strength had seen less than five years' service.

II.—NATIVE ARMY.

The health of the Native Army of India during 1889 though not quite so good as in the previous year was on the whole satisfactory. As shown below there was slightly more sickness than in 1888 with a trifling higher death-rate.

The ratios of sickness and mortality of each section of the Native Army of India for 1887 and the previous year are given in the following table :—

		Average Strength.	Ratio per 1,000 of Average Strength.			
			Admissions.	Daily Sick.	Deaths.	Total Deaths, including Absentees.
Bengal Native Army	1888	63,312	1,066	33	13·60	16·93
	1889	65,360	1,116	37	12·96	16·30
as ditto	1888	25,671	886	36	15·31	20·10
	1889	26,808	856	37	19·21	23·99
bay ditto	1888	23,570	1,080	35	10·52	13·37
	1889	23,993	1,024	33	8·13	10·74
s of Central India and Rajputana	1888	5,233	658	17	5·54	6·07
	1889	5,159	801	21	7·56	9·29
derabad Contingent	1888	6,242	734	27	6·73	10·94
	1889	6,933	555	19	8·65	9·48
India	1888	124,822*	995	33	12·84	16·14†
	1889	128,642	1,003	35	12·94	16·19

* Including Upper Burma for the last nine months of the year.
† Including deaths in Upper Burma in the first three months of the year.

s usual the Central India Irregular Force and the Hyderabad Contingent were the thiest branches of the Native Army. The troops in the Madras Command returned highest death-rate, which was greatly due to the unhealthiness of Madras troops ng in Upper Burma. The chief cause of sickness in the Native Army as a whole ague, which yielded an admission-rate of 465 per 1,000 of strength, or 8 per) less than in 1888. Among other diseases from which the admissions to hospital fewer than in 1888 were cholera, diarrhœa, and simple continued fever, while small-pox, enteric fever, dysentery, respiratory diseases, and venereal diseases was an increase. Respiratory diseases as usual were the chief causes of death in Native Army, the ratio being 3·14 per 1,000 of average strength against 2·68 in The ratios of all branches of the army under this head compare unfavourably those of the previous year, especially that of the Hyderabad Contingent, which ded a death-rate from respiratory disease of 2·59 per 1,000 against 0·96 in 1888. monia alone accounted for 342 deaths or 2·66 per 1,000 of strength. The mortality tive soldiers from pneumonia was nearly six times as great as that of the European rs. From malarial fevers there were 180 deaths among the Native troops, equal) per 1·000. Under these two heads, pneumonia and malarial fever, 31 per cent. total deaths were registered. From cholera the death-rate was only 0·68 per against 2·14 in 1888. Fevers of all kinds were the cause of 21 per cent. of the deaths, just half the mortality of the European troops. From ague, remittent mple continued fevers, the deaths among the Native troops were in the ratio of r 1,000, while among the European troops the proportion was only 0·81. On er hand the death-rate from enteric fever among the Native troops was only 1,000 as compared with 6·11 among the European troops. Dr. Rice states asons to which the exemption of the Native to this disease as compared with pean soldier might be due: "1st. Racial peculiarity; 2nd. Tolerance acquired e of time, generation after generation living saturated in filth; 3rd. Com- ve immunity of Native adults as a result of prevalence of the disease among children." But the last point, which he says, has been put forward by rgeons, "cannot be settled till more is accurately known regarding the diseases of Natives."

The statistics of the Native Army of Bengal for 1889 differed very little from those of the preceding year. There was more sickness, but the death-rate declined from 13·60 to 12·96 per 1,000. Pneumonia caused 26 per cent. of the total deaths, and malarial fevers 11 per cent. From cholera there were 45 cases against 90 in 1888, and 25 deaths against 71. Dysentery and diarrhœa also contributed fewer deaths. Bengal Native Army.

The following statement gives the principal statistics of the regular troops in Bengal, arranged in geographical groups, for 1888 and the preceding year :—

		Average Strength.	Ratio per 1,000 of Average Strength.		
			Admissions.	Daily Sick.	Deaths.
Bengal Proper and Assam	1888	6,273	1,107	41	18·81
	1889	6,799	1,199	40	13·38
Gangetic Provinces	1888	6,684	830	31	8·08
	1889	6,223	615	30	8·84
Rohilkund and Meerut	1888	6,672	998	34	10·19
	1889	6,590	833	32	9·56
Agra and Central India	1888	5,270	1,171	39	9·11
	1889	5,371	1,146	41	10·80
Punjab	1888	21,284	789	24	10·05
	1889	21,957	896	30	8·79
Punjab Frontier Force	1888	12,426	1,369	36	15·61
	1889	12,452	1,493	39	14·62
Quetta District	1888	1,133	1,337	40	22·07
	1889	1,244	1,401	43	24·92

Of the seven groups of stations in the Bengal Command, Quetta district, and the Punjab Frontier Force ranked first in both sickness and mortality, though it will be seen that the death-rate of the latter was below the ratio of the previous year. Three groups recorded lower admission-rates than in 1888, and three higher death-rates, viz., Quetta district, 24·92 against 22·07, Agra and Central India 10·80 against 9·11, and Gangetic Provinces, 8·84 against 8·08. The Bengal Proper and Assam group ranked third highest in admissions, but its death-rate was considerably below that of the previous year, namely, 13·38 against 18·81. Of the large stations with a strength of not less than 1,000, the six following returned death-rates above the Presidency ratio, Edwardesabad 26·39, Meean Meer 25·97, Quetta 23·83, Dehra Dun 19·34, Dera Ismail Khan 17·32, and Dharmsala 15·23.

The health of the corps of Central India and Rajputana (average strength 5,159) was not so good as in 1888. The admission-rate rose from 658 to 801 per 1,000, and the death-rate from 5·54 to 7·56. From all the chief diseases, except cholera, which was absent from this corps, the admissions were greater. Pneumonia and remittent fevers were the principal death causes, the former having accounted for 33 per cent. of the total mortality and the latter 13 per cent. Corps of Central India and Rajputana.

Among the troops composing the Hyderabad Contingent, there was considerably less sickness but a heavier mortality than in 1888. Of an average strength of 6,933, the admissions to hospital were equal to 555 per 1,000 of strength against 734, and the death-rate was 8·65 against 6·73. Ague was the chief cause of sickness yielding 39 per cent. of the total admissions; and pneumonia and cholera were the principal causes of mortality, the former causing 28 per cent. and the latter 15 per cent. of the total deaths. Hyderabad Contingent.

The health returns of the Madras Native Army were again materially affected by the inclusion of the statistics of troops on service in Upper Burma. The ratio of admissions to hospital per 1,000 of an average strength of 26,808 was 856 against 886 in 1888, the daily sick-rate was 37 or 1 per 1,000 more, and the death-rate rose from 15·31 to 19·21 per 1,000. Ague was the cause of 37 per cent. of the total admissions. Madras Native Army.

Cholera was much less prevalent, and the deaths decreased from 107 or 4·17 per 1,000 to 39 or 1·45. Debility caused 16 per cent., and remittent fever 11 per cent. of the total deaths. Of the garrisons with a strength of over 1,000, two recorded death-rates exceeding the Presidency rate, namely, Bellary 25·64, and Mandalay 48·12. Among the Madras troops in Burma during 1889 the death-rate was 50·36 per 1,000.

The health of the Bombay Native Army in 1889 was again very good. Of an average strength of 23,993 the admissions to hospital were in the proportion of 1,024 per 1,000 against 1,080 in 1888; the daily sick-rate was 33 or 2 per 1,000 less, and the death-rate 8·13 against 10·52. The decrease in sickness was principally under cholera, bowel complaints, and respiratory diseases. Ague caused 44 per cent. of the total admissions. Pneumonia was the chief cause of mortality, contributing 26 per cent. of the total deaths, followed by remittent fever with 10 per cent. Of the larger garrisons in this Command with a strength of over 1,000, three recorded a higher mortality than the Presidency, namely, Quetta 14·77, Jacobabad 12·73, and Deesa 8·40.

III.—GENERAL POPULATION.

Vital statistics.

Births were registered throughout all the provinces of India during 1889 excepting Lower Bengal, where the system of limited registration still remained in force, and was confined to 137 of the total 147 municipal towns. The provincial birth-rates varied between 16·36 and 40·28 per 1,000 of population. The best results were obtained in the Punjab, which recorded a birth-rate of 40·28; next in order came Berar with 39·6, the Central Provinces 39·30, North-Western Provinces and Oudh 36·93, Bombay 36·49, Assam 31·20, and Madras 30·9. In all provinces except Bengal, the Central Provinces, Berar, and Coorg, the birth-rate exceeded the death-rate. On the whole, the year was much more unhealthy than 1888, and the total deaths in the 10 provinces rose from 5,016,347 or 25·91 per 1,000 of population under registration to 5,460,071 or 28·95. Lower Burma was the only case in which the registered mortality was less than that of 1888. The increase occurred chiefly in Berar and the Central Provinces, the death-rate of the former having risen from 24·75 to 42·5, and of the latter from 28·70 to 43·79. From all the chief diseases the deaths were more numerous than in 1888. The year was one of great prevalence of cholera, and in all the provinces except Bombay, the Punjab, and Lower Burma, the mortality from it was greater than in 1888. The disease was especially fatal in the Central Provinces, Assam, Berar, Bengal, and Madras, amongst which the death-rate varied between 2·59 and 5·96 per 1,000. Small-pox gave rise to the highest mortality in the Central Provinces (1·99); fevers in the Central Provinces (23·03), and the North-Western Provinces and Oudh (23·10); and bowel complaints in Berar (6·63).

The deaths from the chief diseases and from all causes in the several provinces were as follows:—

	Cholera.		Small-pox.		Fevers.		Bowel Complaints.		Deaths from all Causes.		
	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000 of Population under registration.	
										1889.	1888.
Bengal, excluding Calcutta	171,103	2·59	8,665	0·13	1,101,521	14·72	53,079	0·80	1,597,478	24·25	22·94
Calcutta	1,079	2·49	71	0·16	3,341	7·71	1,331	3·07	11,682	26·97	26·42
North-Western Provinces and Oudh	48,494	1·09	48,243	1·09	1,018,928	23·18	56,447	1·28	1,372,269	31·11	30·08
Punjab	2,838	0·15	7,928	0·42	428,712	22·75	18,066	0·96	595,760	31·62	29·89
Lower Burma	3,242	0·89	2,812	0·77	30,313	8·30	3,088	0·85	62,358	17·07	23·40
Central Provinces	52,588	5·96	17,529	1·99	203,052	23·03	25,894	2·94	386,155	43·79	28·70
Coorg	9	0·05	19	0·11	3,273	18·35	321	1·80	4,087	22·92	19·41
Assam	18,288	4·04	2,245	0·49	73,124	16·15	16,048	3·55	138,986	30·70	27·98
Madras	76,020	2·71	29,138	1·03	230,172	8·23	29,122	1·06	661,178	23·57	21·43
Bombay	32,431	1·97	7,066	0·43	346,878	21·08	48,202	2·93	518,562	31·51	28·44
Berar	10,925	4·16	1,757	0·66	47,104	17·59	17,395	6·63	111,556	42·56	24·75
Total	417,017	2·15	125,453	0·64	3,486,448	18·01	268,903	1·39	5,460,071	28·95	25·91

Bengal.

The registration of vital statistics in Bengal still continued in a very unsatisfactory state. Births were registered in 137 municipal towns out of 148, and in these the ratio was in the proportion of 22·76 per 1,000 of population against 20·63, the ratio of 134 towns in 1888. The supposed standard of birth-rate in India is put down at 40 per 1,000, but this was only reached by six municipalities, while 50 recorded ratios of less than 20 and 15 of less than 10 per 1,000. The Sanitary Commissioner, Dr. Gregg, suggested the re-introduction of registration of births in rural areas, but with results so defective in important municipalities it was not thought desirable to extend the area until some approach to accuracy had been secured in the towns in which such registration is at present attempted. The total number of deaths registered was 1,597,478 or 24·25 per 1,000 against 1,515,735 or 22·94 in 1888. According to age, the mortality among infants under one year was in the ratio of 172·0 per 1,000, the highest yet recorded in Bengal, and that of children of one year and under five 26·7. Both in districts and in towns an improvement was effected in registration, which was

attributed to the special circular issued by Government on the subject, and to the action taken by the Sanitary Commissioner in supplementing the instructions then promulgated. By districts the highest death-rate registered was 44·47 in Poori; Balasore came next with 38·93, Darjeeling 36·28, Julpigoree 33·27, Noakholly 32·04, and Purneah 31·09, the remainder varying between 30·71 and 15·78.

The deaths from cholera amounted to 171,103, representing a mortality rate of 2·59 per 1,000, against 111,391 or 1·68 in 1888. The disease was also more widespread than in the previous year, every district having been visited; but, contrary to previous experience, it affected rural more than urban circles in proportion to population. Of the total villages 11·32 per cent. were attacked against 8·29 in 1888. As usual, the province was comparatively free from cholera during the earlier months of the year; but it prevailed with much severity in the hot weather, especially in April, when there were 33,003 deaths. The chief feature in the cholera history of the year was the excessive mortality in Orissa division, especially in Poori district, where the cholera deaths equalled 21·01 per 1,000. In the other two districts of the division, Balasore and Cuttack, the mortality from the disease was 13·74 and 8·29 respectively. In the town of Poori the deaths from cholera were in the ratio of 23 per 1,000 of population, which appears to have been largely due to preventable causes. The Civil Surgeon of the station noticed the insanitary condition of the tanks of Poori, and the consumption of unwholesome food by pilgrims, a state of things which the Government of India observe call for vigorous action on the part of the authorities; and they have directed that steps be taken for securing better management and sanitary supervision at places where large numbers of visitors congregate from different parts of the country. The disease was also specially severe in Purneah district, the mortality being 9·60 per 1,000. The outbreak was the severest known for years, and is supposed to have originated at the Caragola fair, and so to have spread over the district. The Sanitary Commissioner testified to the attention paid by medical officers to cholera, and to their having visited affected places at great personal inconvenience and risk to themselves, and advised the local authorities as to the best means of preventing the spread of the disease.

From small-pox the deaths exceeded the number registered in the previous year by 2,418, the total of 1889 being 8,665; but the death-rate, 0·13 per 1,000, while higher than that of 1888, was less than the average of the 10 years period, 1878–88, viz., 0·20 per 1,000. All the districts recorded small-pox deaths except Maldah. The chief sufferers were Poori, Chumparun, Bankoora, Shahabad, Patna, and Mymensing. Of the total mortality, 70·62 per cent. occurred among children under 12 years of age, but this is an improvement on the previous year, when the percentage was 80·82. The excessive mortality among children is stated to be due chiefly to the difficulty experienced in some districts in inducing parents to have their children vaccinated, even in the face of severe epidemics.

Deaths from fever were registered to the number of 1,101,521, representing a death-rate of 16·72 per 1,000 of the population, an increase of 9,419 or 0·19 per 1,000 on the fever mortality of 1888. Each year shows a steady increase in fever deaths; but this is attributed more to improvement in registration and increase in the population than to greater unhealthiness of climate. Fourteen of the 45 districts recorded fever death-rates of over 20 per 1,000, Julpigoree heading the list with 29·18, the chief cause in each case being impeded drainage. "The prevalence of malarial fever in Bengal," the Sanitary Commissioner states, "is sometimes attributed to inundations and artificial "irrigation. Inundations, however, are not in themselves hurtful; on the contrary, "they are beneficial as a means of flushing. It is only when the surface drainage is "obstructed, and the water sinks into and stagnates in the soil, that the locality "becomes malaribus." In his report he gives extracts from the reports of Civil Surgeons confirming this view.

The total number of deaths registered from bowel complaints was 53,079 or 0·80 per 1,000 against 52,086 or 0·78 in 1888. "There can be no doubt," the Sanitary Commissioner says, "that the prevalence of bowel complaints is prominently due to "climatic influences acting on the poorer people, who for the most part sleep on the "ground, wear wet and insufficient clothing, and drink impure water. It is also "brought about by errors of diet, and inordinate eating after partial starvation."

The number of deaths recorded in Calcutta during 1889 was 11,682, or three less than in the previous year, the death-rate being 26·96 per 1,000 of population. From cholera the mortality (1,079) was less than in any of the previous 18 years but one (1880). Fever deaths (3,341) were slightly in excess of the two previous years, but still below the other eight years of the decade; and from small-pox the deaths

rose from 12 in 1888 to 71. Owing to the large fluctuating population of Calcutta the calculation of the death-rates on the census of 1881 is not considered a satisfactory basis. "There is this important point always to be remembered," the Health Officer, Dr. Simpson, states, "that, however favourable the Calcutta death-rate may appear, it "really only represents a part of its death-rate, and not its real death-rate, for Calcutta, "being peculiar in having two-thirds of its population merely temporary residents, "there are no means of including the death-rate of that large proportion of the popu- "lation who, unless attacked by an illness which disables them, at once go when sick "to their own homes to die."

North-Western Provinces and Oudh.

The registration of vital statistics in the North-Western Provinces and Oudh during 1889 is reported to have been conducted with less energy than in previous years in spite of the attention that has continually been directed by the Government of India and the Local Government to the necessity for securing more accurate results. The registered births amounted to 1,629,210 giving a ratio of 36·93 per 1,000 of population, showing a decrease of 58,229 or 1·32 per 1,000 on the previous year. With the exception of 1879 and 1880, the first years of registration, the birth-rate of the year under notice was the lowest on record. By districts the birth-rate varied from 50·26 in Moradabad to 25·00 in Manipuri. The total number of recorded deaths was 1,372,269 or 31·11 per 1,000 of population against 1,327,113 or 30·08 in 1888, the increase being partly due to the greater prevalence of cholera and small-pox. The ratio of mortality varied from 55·42 in the Tarai district and 47·70 in Lalitpur to 21·86 in Jaunpur. Of the 49 districts 27 recorded a death-rate above the average of the province. In 18 districts there was an excess of deaths over births, ranging from 13·81 per 1,000 of population in Tarai to 1·36 in Manipuri. Infantile mortality continued very high, though there was a slight decline in the death ratio of children under one year of age from 215·77 in 1888 to 213·49. This, however, the Sanitary Commissioner, Dr. Hutcheson, accepts with caution, as there was a considerable rise in the mortality among children between the ages of one and five. "The age periods," he says, "although sharply defined in tabular statements, do not accurately represent "the ages at which death occurs, as the present registering agency record not the "actual, but, in most instances, only the supposed age." The proportion of deaths among children under five years of age to the total mortality was 45 per cent.

Cholera prevailed to a much greater extent in 1889 than in the previous year. All the districts but one (Dehra Dun) recorded deaths from the disease, the total amounting to 48,494 or 1·09 per 1,000 against 18,704 or 0·42 in 1888. The mortality was excessive in the districts of Kumaon (14·1), Tarai (5·5), and Lalitpur (5·7). In seven other districts it was also severe, exceeding 2 per 1,000 in each. In Kumaon the number of deaths from cholera reached 6,964 equal to 37 per cent. of the deaths from all causes. It appears that after 1879 cholera was little known in Kumaon till 1884, when the death-rate reached 0·9 per 1,000; after two years' disappearance it rose in 1887 to 4·6, and in 1889 to 14·1, and is reported to have again visited the district in a virulent and persistent form in 1890. The re-appearance of the disease in Kumaon since 1887 is a fact to which the Local Government has directed the careful attention of the Sanitary Commissioner. With the exception of a few cases of cholera at the Magh Mela at Allahabad, there has been no outbreak of the disease at any of the principal fairs held in the province for three years.

The deaths from small-pox rose from 25,000 in 1888 to 48,243, and the death-rate from 0·5 to 1·09 per 1,000. The mortality was again heaviest in Oudh, where vaccination made least progress. The districts in Oudh which suffered most were Hardoi (8·14), Unao (6·91), Bara Banki (5·41), Sitapur (4·92), Lucknow (3·42), and Rae Bareli (2·81). In several other districts the mortality was above the general rate of the province. In four municipalities in the Hardoi district the death-rate from small-pox was exceptionally great, ranging from 17·02 to 6·58 per 1,000; and in several other towns excessive mortality occurred. Of the total 48,243 small-pox deaths nearly 90 per cent. were of children under 12 years of age.

Under fevers 1,018,928 deaths were recorded, giving a ratio of 23·10 as compared with 23·89 in 1888. Dr. Hutcheson points out that "fever" is a common term used by the illiterate reporting agency to represent several diseases other than the classified fevers of medical nomenclature, and he thinks it probable that not one half of the mortality was due to any recognised form of fever, but to other causes. The fallacious nature of the statistics is shown by comparing them with those relating to the troops and jail population; while the percentage of deaths from fever to deaths from all causes ranged from 31·1 among European troops to 16·5 among Native troops, and

to 9·3 among the jail population, the mortality, by comparison, among the civil population rises to the enormous figures of 81·3 in 1888 and 77·8 in 1889. Dr. Hutcheson considers that the actual relative mortality from true fevers does not probably much exceed 25 per cent. instead of 81 and 77 per cent. as recorded. In 1888 the Local Government requested the Sanitary Board to advise them, after such preliminary survey of the province as in the circumstances is possible, as to the tracts which, from their known unhealthiness, from defects of drainage, or other causes, more especially require the attention of Government. As no report had been received, the Lieutenant-Governor requested that it should be expedited.

The deaths attributed to bowel complaints numbered 56,447 or 1·28 per 1,000 against 52,288 or 1·19 in 1888. There is little doubt, however, that the deaths from this cause are understated. The district death-rates, ranging from 10·44 in Garhwal to 0·8 in Kheri and Bahraich, and 0·7 in Gonda, serve as an illustration of the caution with which statistics showing the relative causes of death should be received. In the districts of Jaunpur, Mainpuri, Pilibhit, Bahraich, and Gonda, less than 100 deaths were recorded under bowel complaints, and it seems incredible, it is remarked, that in Gonda only 85 such deaths out of a total of 34,685 should have occurred.

Punjab.

Registration of births in the Punjab during 1889 was attended with satisfactory results. The birth-rate was 40·28 per 1,000 of the population, being an increase of 2·96 on the ratio of the previous year, and higher than it had been since 1884. There were 759,049 births registered against 703,113 in 1888. The district rates ranged from 52·66 in Sialkot and 51·62 in Gurdaspur to 15·54 in Peshawar and 15·00 in Simla. As usual, the lowest rates were registered in the frontier districts, and were attributed to defective registration, and though the attention of frontier officers had been called to the subject, the respective rates exhibited very little improvement. The general health of the province during 1889 was not so good as it had been for some years past, which was chiefly due to the great prevalence of malarial fever. The number of deaths registered was 595,760, giving a death-rate of 31·62 per 1,000 as compared with 563,229 or 29·89 in 1888. It will be seen, therefore, that the birth-rate exceeded the death-rate by over 8 per 1,000. Infantile mortality was again very high, that for males being 253·71 and for females 242·00. These figures, the Local Government point out, would seem to indicate that female infants are as well cared for as male infants. It is possible they say that the deaths of female infants are more often not reported than those of male infants. The province has always been noted for an excess of female over male mortality, and it was more marked than usual in some districts. In the Jhelum and Rawalpindi districts the deaths of females were 6 per 1,000 more than those of males. In accordance with the request of the Government of India, inquiries into the subject were made with the result that in two divisions it was believed that female infanticide was largely practised by certain classes, while in the other two the high female mortality was believed to be more the result of neglect than of actual violence. Female infants are said to be less valued than male, less warmly clad in the cold weather, and, being less robust, are more susceptible to disease than male infants, and succumb more easily when attacked by disease. But though the provincial death-rate was 1·73 per 1,000 greater than in 1888, and 1·07 above the average of the preceding five years, the mortality was not greater than usual in every district. Jhelum district recorded the highest death-rate in the province, viz., 42 per 1,000 against 32 in 1888, followed by Rawalpindi with 40 against 28; and it was the high mortality in these two districts which contributed mostly to raise the death-rate of the province.

Of the chief diseases cholera was considerably less fatal than in the previous year, the deaths having decreased from 14,938 or 0·79 per 1,000 to 2,838 or 0·15. Of the 31 districts in the province 8 were free from the disease, and in 9 others the deaths in each were below 20. The districts in which the mortality was the highest were Rohtak, Simla, Hoshiarpur, Jullundur, Delhi, and Gurgaon, where the death-rate varied from 0·89 to 0·40 per 1,000. In his report for 1889 the Sanitary Commissioner, Dr. Stephen, furnishes a statement contrasting the monthly average prevalence of the disease for the 22 years, 1867–88, with that of 1889, and from this it appears that August and September were the two most fatal months in 1889 and during the 22 years. In another statement he compares the death-rate in 32 municipal towns with that in 303 villages, the former giving a death-rate of 1·06 per 1,000, and the latter 4·87. This difference is in accordance with the experience of former years, and though the death-rate, as a whole, in municipal towns was 6 per 1,000 greater than in country tracts, yet this was reversed in the case of cholera, the disease being

more than four times less in affected municipal towns than in certain affected villages.

The mortality from small-pox was less than half what it was in 1888, the registered deaths having fallen from 16,938 or 0·90 per 1,000 to 7,928 or 0·42. Deaths from this cause were reported from every district, and one or more deaths occurred in 7·3 per cent. of the towns and villages of the province. The districts which recorded the highest death-rates were Montgomery 2·26, Peshawar 1·25, and Lahore, Karnal, Sialkot, Hazara, and Bannu, with ratios varying from 1·08 to 0·60 per 1,000. In the city of Peshawar the disease appeared in an epidemic form in the beginning of October, and from then to the end of the year 319 deaths occurred. Six vaccinators were at work in the city, and the people who usually are reluctant to allow their children to be vaccinated brought them pretty freely during the epidemic to be operated on.

The deaths registered under fever were enormously greater than the numbers recorded under other classes of disease. There were 428,712 fever deaths registered, being in the ratio of 22·75 per 1,000 against 379,893 or 20·16 in 1888, showing an increase of 48,819. It is noticed that the deaths from this cause will always largely exceed that from every other disease, because, although a large proportion of the community escape various types of sickness, few, comparatively speaking, escape throughout the year without one or more attacks of fever. "Every effort, therefore," the Lieutenant-Governor remarks, "should be made by schemes of drainage and "sanitation to reduce this high mortality, and save the people from a disease which "must greatly deteriorate the physique and energy of the population." Hitherto certain districts in the Delhi division have been notorious for the prevalence of fever, but in 1889 the deaths were not so numerous as usual. The mortality, however, was much higher in the Jhelum, Rawalpindi, Gujranwala, and Bannu districts than in any districts of the Delhi division, and also, but to a less extent, in Ferozepore and Muzaffargarh. This shifting of the fever mortality Dr. Stephen ascribed to the peculiarity of the rainfall of the year, which was less than usual in the eastern portion of the province, and above the average in the western tracts. Most of the Civil Surgeons of districts in which the fever death-rate was high were of opinion that a great many of the so-called fever deaths were due to pneumonia. "It is a well "known fact," Dr. Stephen says, "that in the province, when malarial fevers have "been very prevalent during the autumn months, deaths from pneumonia are very "frequent during the cold weather months."

Under bowel complaints the registered deaths were 18,066 or 560 less than in 1888, the rates for the two years being 0·96 and 0·99 respectively. The highest district death-rates from this cause were 3·22 in Dera Ismail Khan and 3·05 in Simla. In the former the mortality was attributed to a severe outbreak of dysentery during the last quarter of the year, and in the latter to the prevalence of diarrhœa among all classes, owing to the continuous and heavy rainfall from early in June to the end of August.

Lower Burma.

Considerable attention was given to the registration of vital statistics in Lower Burma during 1889: but there is still much room for improvement. In order that full advantage might be taken of the information afforded by the census, district and municipal officers had been urged to give very special personal attention to the accuracy of the registration during 1890. "Deductions regarding birth and death rates," the Sanitary Commissioner, Dr. Sinclair, observes, "especially in a country like "Burma, undergoing rapid development, are very apt to mislead if the ratios have to "be calculated on census figures not of recent date." There were 77,296 births registered in 1889, equal to 21·15 per 1,000, against 87,350 or 23·91 in 1888.

The total number of deaths registered was 62,358 or 17·07 per 1,000 as compared with 85,486 or 23·40 in 1888. This decrease, it is pointed out, unlike that in the statistics of births, was not solely due to deterioration in the work of collection, for the year 1888 was exceptionally unhealthy. The ratio of deaths by districts ranged from 10·37 per 1,000 in Toungoo to 28·34 in Hanthawaddy. The excess of births over deaths per 1,000 of population was four against one in 1888.

From all the chief diseases except small-pox the mortality was considerably less than in the previous year. The deaths from cholera decreased from the abnormal figure of 15,982 or 4·37 in 1888, which was a year of great epidemic prevalence, to 3,242 or 0·89. The districts which suffered most severely were, Bassein (663 deaths), Amherst (560), Thongwa (497), and Mergui (421). Amongst the towns the mortality was worst in Moulmein (391), and Mergui (141). "There can be no doubt," the Chief Commissioner remarks, "that the conditions of Moulmein town are thoroughly

" insanitary, and that measures for their improvement will have to be of a somewhat " sweeping character, and may entail considerable expenditure. The municipal " income is not sufficient to bear any great outlay, and up to the present the Municipal " Committee have been very reluctant to take measures for increasing it, although the " town is by no means heavily taxed."

There was a large increase in small-pox deaths, viz., from 571 in 1888 to 2,812 or 0·77 per 1,000, which is the highest ratio recorded with the exception of those of the years 1880 and 1884. The districts of Tharrawaddy, Prome, and Bassein suffered most, and together contributed nearly 70 per cent. of the small-pox deaths. The mortality among children under 12 years of age was over 86 per cent. of the total. Amongst the principal towns, Prome and Thayetmyo recorded the largest number of deaths, 234 and 103 respectively. The Vaccination Act having now been extended to Prome any recurrence of the epidemic may possibly be prevented.

The deaths registered under fevers amounted to 30,343 or 8·30 per 1,000 of population, being 6,048 or 1·66 less than the mortality of 1888. The ratio of deaths was highest in the Arakan division (11·30), and lowest in the Irrawaddy division (6·15). The district death-rates ranged from 13·59 in Sandoway to 3·12 in Thongwa.

From bowel complaints there was a decline in the deaths of over 50 per cent. compared with the previous year, the total number being 3,088 or 0·85 per 1,000 against 6,459 or 1·77.

Central Provinces.

The year 1889 in the Central Provinces was a most unhealthy and trying one. For the first time since registration was placed on a satisfactory footing, the reported death-rate outran the reported birth-rate of the population, and the returns everywhere afforded evidence of depressed vitality, originating in bad harvests and continued prevalence of high prices of food, which made the people exceptionally susceptible to the inroads of disease. The extreme unhealthiness of the year was attributed to two causes, the first being excessive heat and drought. The rains of 1888 ended early, and the wells were already low when the abnormally hot season of 1889 commenced. Over large tracts of county the water-supply was accordingly deficient and exceptionally foul. The second cause was the heavy rainfall which followed on the drought, the total fall being 1½ inches above the average of 23 years. The fall was also badly distributed, and therefore unfavourable for the crops in many districts. It was short in September, and the hot sun of that month acting on a saturated soil gave to malarious fever and all cognate diseases an exceptional virulence. The registered births fell from 366,050 or 41·52 per 1,000 in 1888 to 346,515 or 39·30 per 1,000, which was the lowest birth-rate recorded for nine years, except that of 1886, when the ratio (37·79) was exceptionally low. The decrease was spread over 13 of the 20 registration districts. The total number of deaths registered was 386,155 or 43·79 per 1,000, an increase of 133,094 or 15·09 on the figures of the previous year. All districts without exception recorded a higher death-rate than in 1888, the highest being 60·08 in Saugor and the lowest 32·73 in Balaghat.

Cholera raged throughout the province the whole year, no district escaped, and while in most districts it did not appear till April, in some it was reported in every month except January. The total deaths from the disease were 52,588, representing a ratio of 5·96 per 1,000 of population against only 921 or 0·10 in 1888, and a five years' mean ratio of 1·18. Of the districts in which cholera prevailed, Chanda, Bilaspur, Raipur, and Sambalpur suffered most, their death-rates being 13·71, 11·38, 10·97, and 10·38 respectively. Full and interesting reports of the epidemic were furnished by most of the Civil Surgeons, but none of them succeeded in throwing any light upon its origin and causes. There appeared to be no doubt that insanitary conditions favoured the more rapid spread and fatality of the disease. Although cholera was much more fatal than it had been since 1874 only 15 per cent. of the villages were attacked by it.

Small pox also prevailed throughout the province, and was much more fatal than in the preceding year. The deaths numbered 17,529 or 1·99 per 1,000, as compared with 10,729 or 1·22 in 1888. That the disease was very general in all districts is shown by the fact that 142 of the 160 registering circles recorded deaths from it. In all the districts but four small-pox was much more fatal than in 1888. Bilaspur headed the list with a death-rate of 5·64 per 1,000 against a five years' mean of only 0·85; Nagpur followed with 4·57 as compared with its five years' mean of 0·79, Wardha with 3·82, and Raipur with 3·48; in no other district was the provincial average reached. Of the total deaths 7,598 were of infants under one year of age, and 7,117 were of children between 1 and 12 years. "The foregoing figures teach," the Sanitary Commissioner, Deputy Surgeon Pilcher says, "that there is a large proportion " of the population unprotected by vaccination or inoculation, and this fact is still

" more impressive when it is remembered that the number of deaths represents at " most but half the number of cases of small-pox which actually occurred, that the " periodical increase of small-pox is not adequately explained by the fact that inoculators " are at work or that the people themselves resist vaccination, for these factors are " constant. But there is also one encouraging fact in the figures of the last two " decades, in that they show the population of these provinces to have suffered less in " the 10 years ending with 1889 than it did in the 10 years ending with 1879, and " it must be taken for granted that the registration of deaths and the causes of death " were much more accurately reported than they were in the previous 10 years."

Of the total number of deaths 52 per cent. were ascribed to fevers. There were 203,052 fatal cases, giving a ratio of 23·03 per 1,000 against 158,195 or 17·94 in 1888. The excessive variations in temperature and humidity which characterised the year were considered to be potent factors in the production of this result. Malarial fever caused the largest mortality, " and was seen most commonly in its chronic and wasting forms." In four districts the death-rate exceeded 30 per 1,000, and in eight others it was higher than the average for the province. The districts of Betel, Nagpur, and Sambalpur recorded the lowest mortality, but registration in these districts is reported to be very defective.

The number of deaths registered under bowel complaints was 25,894 or 2·94 per 1,000 as compared with 17,618 or 2·00 in the preceding year. Much of this disease, it is stated, was doubtless due to malarious dysentery, for the largest mortality was returned in those months in which fever was most general and fatal.

The registration of vital statistics in Assam in 1889 was not attended with very satisfactory results. The number of births registered fell from 143,153 in 1888 to 141,236, and the ratio per 1,000 of population from 31·60 to 31·20. The decrease occurred chiefly in the districts of Kamrup and Sylhet, in the former of which a similar result had been progressive since 1886, and had been coincident with a corresponding increase in fever mortality (including *kala-azar*). The provincial birth-rate was a mean of district ratios ranging from 21·63 in Kamrup to 39·86 in Cachar. The total number of deaths in the province was 138,986 or 30·70 per 1,000 against 126,654 or 27·98 in 1888. The death-rate of 1889 was made up of ratios ranging from 24·46 in Nowgong to 37·65 in Cachar. All the chief diseases were more fatal than in 1888. Assam.

The year's mortality was largely swelled by a considerable increase in cholera deaths, the number having risen from 9,693 or 2·14 per 1,000 in 1888 to 18,288 or 4·04. The increase occurred chiefly in the Surma Valley districts (Cachar and Sylhet), where the deaths amounted to 11,270 in 1889 as compared with 2,726 in 1888, and in the Brahmaputra Valley districts of Darrang and Nowgong, in the former of which there were 2,445 cholera deaths against 1,051, and in the latter 1,356 against 301. The Sanitary Commissioner, Deputy Surgeon-General Costello, was inclined to attribute the cholera outbreak to increased importation of the disease by garden coolies. The Chief Commissioner, however, preferred not to hazard an opinion on the matter, being confident that the measures initiated by the Bengal Goverment in the direction of providing for the sanitary supervision of coolies during the passage through Bengal could not fail to be attended by beneficial results.

From small-pox 2,245 deaths were registered, being an increase of 186 on the number of 1888. The increase, with a few insignificant exceptions, was limited to the Sylhet district, where there were 2,060 fatal cases as compared with 1,339 in the previous year. All the districts were affected except Nowgong and Lakhimpur. The increase in Sylhet was attributed to the prevalence of the practice of inoculation. The practice is reported to have taken such a hold on the minds of the people that in the Habiganj sub-division of the district, where 75 per cent. of the total mortality occurred, vaccination had almost fallen to zero. No improvement can be expected, the Sanitary Commissioner says, until inoculation has been made penal, and the authorities are in a position to enforce vaccination. This question was under the consideration of the Chief Commissioner.

The number of deaths registered as due to fevers was 73,124 or 16·15 per 1,000 against 71,825 or 15·87 in the previous year. The increase was attributed partly to more accurate registration and partly to a greater mortality from *kala-azar* in certain districts, as Kamrup and Goalpara, which recorded fever death-rates of 23·24 and 27·78 respectively. An inquiry into the nature and cause of *kala-azar* was made during the year. The most prominent symptom was found to be anæmia, caused by the presence in the small intestines of the well-known and fatal parasite *anchylostoma*. " There is no doubt," the Sanitary Commissioner remarks, " but that the state of

" malarial cachexia, to which the people of the Kamrup and Goalpara districts are " reduced by constant attacks of malarious fever, would render them all the more " easy prey to the attacks of such a parasite as the *anchylostomum*, and would " also make them more likely to succumb to the extreme anæmia, &c., resulting " therefrom."

Under bowel complaints 16,048 deaths were registered or 3·55 per 1,000 of population against 14,726 or 3·25 in 1888. Lakhimpur district recorded the highest death-rate (8·95), followed by Sibsagar (7·37) and Cachar (6·14).

Madras.

Registration of vital statistics in the Madras Presidency during 1889 was attended with better results than in the previous year, though the returns, as a whole, are still far from accurate. The total number of births registered was 867,523 or 30·9 per 1,000 of population against 833,345 or 29·9. Taking the standard birth-rate as 40 per 1,000, only three districts reached it; in 10 it was over 30 and under 40, and in the remainder it was under 30 per 1,000. Judged by the death statistics the year was more unhealthy than any since 1878, and under all heads the deaths were more numerous than in 1888. The total registered deaths amounted to 661,178, equal to a death-rate of 23·57 per 1,000, exceeding the ratio of the previous year by 2·14, and the average rate for the five years 1884–88 by 2·0 per 1,000. As usual, the mortality among infants under one year of age was high, though lower than that in other provinces, amounting to 154·3 per 1,000 of the infantile population. By districts the mortality ranged from 42·6 in Madras to 15·6 in Nellore. The high mortality of the Madras district, where the deaths exceeded the births, is a fact, the Government state, which calls for earnest consideration, and the matter has again been brought to the notice of the President of the Municipality for report. In 11 districts the death-rates were higher in 1889 than in 1888, the largest increase having occurred in Ganjam, where the rate, owing to the famine which prevailed in the district, rose from 17·9 to 40·9. The mortality, the Sanitary Commissioner (Surgeon-Major Laing) says, must have been infinitely greater if the Government had not organised a system of aid which was most thoroughly calculated to bring relief to all who sought it. The death-rates among the urban and rural populations were respectively 28·0 and 22·9 per 1,000 against 27·9 and 20·7 in 1888.

There was a marked increase in the number of deaths from cholera compared with former years; they numbered 76,020 or 2·71 per 1,000 against 58,677 or 2·10 in 1888. The increase of 17,343 was mainly accounted for by the severe outbreak which accompanied the famine in Ganjam, where no less than 13,932 fatal cases, equal to 14·2 per 1,000 of population, were reported to have taken place, though the Sanitary Commissioner had no doubt that the registration of cholera mortality was a good deal confused with famine diarrhœa. In no month of the year was the Presidency free from the disease. Every district reported deaths, and in 13 cholera was prevalent in them, more or less, throughout the year. The epidemic also spread to Vizagapatam and Godavari districts, which returned death-rates of 5·4 and 5·0 per 1,000; but over the rest of the Presidency cholera was less prevalent than in 1888. Contrary to what is usually observable, it is stated, the epidemic reached its maximum intensity in June and July, and it is noticed that the same months formed the period when the highest prices were ruling in Ganjam, and when, consequently, it may be assumed that the stress of famine was most felt. In all but five of the 77 towns deaths from cholera were registered, and in 27 the death-rate was above 5 per 1,000; those most affected were Berhampore and Parlakimedi in Ganjam, and Salur in Vizagapatam, each of which recorded cholera death-rates of over 23 per 1,000; in five other towns the mortality exceeded 10 per 1,000.

The mortality from small-pox was higher than that of 1888, but less than the average of the preceding five years. The number of deaths registered was 29,138 or 1·03 per 1,000 as compared with 21,858 or 0·78. But although the total for 1889 exceeded that for the previous year there was a decrease in eight districts. The mortality was again highest in Kurnool and Ganjam districts, the ratios being 4·3 and 4·2 respectively. In the case of the former the high rate was attributed to the famine, and in the latter to the opposition of the people to vaccination. "Nearly all historical " records of scarcity in India," the Sanitary Commissioner states, "show that small-" pox is a most common attendant on those forms of distress that cause disruption of " village and family life, and tend to the massing of the people in crowds." As usual by far the larger number of the small-pox deaths occurred among children under 12 years of age—nearly two-thirds of the total, or 61 per cent.

From fevers the registered mortality was 230,172 or 8·23 per 1,000 of the population against 204,561 or 7·34 in 1888. "A principal cause of the increased mortality from "fevers in 1889," the Sanitary Commissioner writes, "was doubtless due to the "heavy rainfall which occurred in some districts, producing a water-logged condition "of the country, which is well known to be a most common cause of malarial diseases. "Although we are yet in the dark as to the actual cause of fevers, yet it has been "proved beyond all manner of doubt that efficient drainage, agriculture, and improved "sanitary conditions may transform the whole aspect of a country, changing its "inhabitants from pitiable objects into vigorous, healthy, and happy people." In their Resolution on the Sanitary Commissioner's Report, the Government notice that the increase, though regrettable, can hardly be regarded as a clear indication of the greater prevalence during the year of fevers in the medical acceptation of the term, as the classification under this head, in many rural parts, of all diseases accompanied by febrile symptoms is, as may naturally be expected, of a very indiscriminate character.

There were 29,122 deaths recorded under bowel complaints during 1889, or 1,401 more than in the previous year, the death-rate, 1·06 per 1,000, being the same in both years. The town death-rate under bowel complaints was much higher than in rural tracts, viz., 3·5 and 0·9 respectively. No reliance can, however, be placed in these statistics, as there appears to be no doubt that in rural areas a large number of deaths which should be classified under this head are ascribed to fevers.

The registration of vital statistics in Bombay Presidency received a check in 1889. During the year there were 600,489 births registered, representing a ratio of 36·49 per 1,000 of the population against 634,693 or 38·57 in 1888. There was therefore a decrease of 34,204, which was spread over all but five of the districts of the Presidency. The year was exceptionally unhealthy, and the deaths rose from 468,039 or 28·44 per 1,000 in 1888 to 518,562 or 31·51. By districts the mortality ranged from 45·19 in Nasik to 15·75 in Upper Sind Frontier. In Nasik, City of Bombay, Broach, and Ahmedabad, the recorded death-rate exceeded the birth-rate, which was attributed to defective registration of births. Of the total deaths, 43·13 per cent. occurred among children under five years of age. The recorded death-rates among the urban and rural population were respectively 33·12 and 31·30 per 1,000 against 31·35 and 28·04 in 1888. Bombay.

Cholera was less fatal than in 1888, the deaths having decreased from 36,500 or 2·22 per 1,000 to 32,431 or 1·97. Every district was attacked, but the epidemic was most severely felt in the Bijapur, Sholapur, and Nasik districts, while the death-rates therefrom were 5·77, 4·79, and 4·41 respectively. The disease also prevailed extensively in most of the inland districts, and in the coast districts of Surat, Broach, and Thana; but, except in Karachi, the districts in Sind suffered less than others. Out of the 24,535 villages in the Presidency, 2,831 or 11·54 per cent. were affected by cholera.

Small-pox on the other hand was unusually fatal, causing 7,066 deaths against 3,617, though the small effect of this disease on the mortality of the Presidency is shown by the low death-rate of 0·43 per 1,000. All the districts were affected, but only in the Sind districts of Karachi and Hyderabad did the disease prevail to any extent, the death-rates being 1·94 and 1·12 per 1,000 respectively. Among children under one year of age the mortality was in the proportion of 25·32 per cent. of the total, and among children between one and twelve years it was 49·09 per cent.

Two-thirds of the whole mortality were ascribed to fevers. The registered number of deaths was 346,878 or 21·08 per 1,000, being greater by 42,429 or 2·58 than in the previous year, and greater than in any year since 1878. Of the five registration districts Gujarat recorded the highest fever mortality, 27·36 per 1,000, and the Southern registration district the lowest, 17·88. All but four of the 24 districts returned a higher fever death-rate than in 1888. It is observed that in several of the districts in which registration was most defective, almost all of the deaths were reported as due to fever. In Shikarpur they were in the proportion of 92 per cent., in the Upper Sind Frontier and Parkar districts 90 per cent., in the Panch Mahals 88 per cent., and in Hyderabad 86 per cent., while, on the other hand, in Bombay City, only 31 per cent. of the registered deaths were caused by fever.

Under bowel complaints 48,202 deaths were registered, equal to 2·93 per 1,000 of population, against 45,462 or 2·76 in 1888. Some of the inland districts recorded a very high mortality, notably Belgaum (8·57) and Dharwar (7·07). In 12 districts the death-rate was higher than in the previous year, and in 11 lower.

Though the registration of vital statistics in Berar is reported to have received considerable attention during 1889, the results on the whole were not so satisfactory as those for 1888. The total number of births registered was 103,780 as compared with 108,390 in 1888, the birth-rate being 39·6 against 41·3 per 1,000 of population. According to districts the highest ratio, 45·6, was as usual registered in the Buldana district, and the lowest, 36·6, in Akola. Among the urban and rural population of the province, the birth-rate was 36·8 and 40·0 respectively against 38·5 and 41·6 in 1888. Better results are expected under the new system of compulsory registration which was shortly to be introduced into every municipality. The year was a particularly unhealthy one, and under every head of disease the mortality was greater than in the previous year. From all causes the registered deaths numbered 111,556, representing a ratio of 42·56 per 1,000 against 64,865 or 24·75 in 1888, and a five years' mean of 33·0. There was thus an excess of deaths over births of 7,776. Nearly half of this mortality was made up of deaths occurring among infants and children under five years of age. By districts, the death-rate ranged from 37·0 in Wun to 49·3 in Basim.

There was a tremendous rise in the mortality from cholera, the deaths having increased from 305 in 1888 to 10,925 or 4·16 per 1,000 in 1889. The disease was most severely felt in the Basim district where the deaths attained the very high ratio of 11·1 per 1,000. In the other five districts the mortality ranged from 2·0 to 4·0 per 1,000. Out of 5,567 villages, 817 or above 14½ per cent were affected, and the average number of deaths in each was 13·3.

From small-pox, the recorded deaths rose from 817 in 1888 to 1,737 or 0·66 per 1,000. Of these, 523 or 30·1 per cent. occurred amongst infants under one year of age, and 916 or 52·7 per cent. amongst children between one and 12 years. More than a half of the deaths took place in Basim and Amraoti districts, the former yielding 483, and the latter 426; but while Basim showed the greatest number of deaths, its death-rate from this disease was lowest (0·13), except that of Ellichpur (0·08); the highest was in Amraoti (0·7). Among the towns, Basim registered the highest small-pox death-rate (3·5). In several other towns the mortality rates were high, indicating insufficient protection by vaccination.

The total number of deaths registered under fevers was 47,104 or 17·59 per 1,000 of population, exceeding the figures for the previous year by 17,125 or 6·5 per 1,000. As usual, Wun and Basim kept their respective places at the top and bottom of the list of districts, the death-rate of the former being 24·1, and of the latter 13·1. As regards seasonal prevalence, the last six months of the year were the most fatal, especially September and October, when the rainfall was greatest.

The deaths registered under bowel complaints amounted to 17,395 or 6·63 per 1,000 against 9,987 or 3·82 in 1888. The year's mortality was made up of ratios ranging from 9·3 per 1,000 in Ellichpur district to 2·7 in Wun.

Over a fourth (33,323), of the total deaths were registered under "other causes," an increase of 10,665 on the figure of 1888. The Sanitary Commissioner has been asked to explain the growth of these figures.

IV.—JAILS.

Sickness and mortality in 1889.

The health of the jail population of India during 1889 was less favourable than in the previous year. The ratio of admissions into hospital per 1,000 of average strength rose from 1,004 to 1,041, the daily average sick-rate from 33 to 35, and the death-rate from 33·10 to 35·63. The increase in mortality occurred in six out of the ten provinces; in the remaining four there was a decrease, though of no great extent except in Coorg, where the jail death-rate was less by 11·71 per 1,000. The most unhealthy jails were those in Assam, Madras, and the Central Provinces, the death-rates of which exceeded those of 1888 by 18·65, 13·03, and 10·38 per 1,000 respectively. The increased mortality was due mainly to cholera and dysentery and diarrhœa. From the former the deaths rose from 368 or 4·65 per 1,000 to 489 or 5·78, and from the latter from 777 or 9·20 per 1,000 to 878 or 10·40. The increase in cholera deaths was spread over five provinces, Madras recording 110 fatal cases against 12 in 1888, the Central Provinces 69 against *nil*, the North-Western Provinces and Oudh 44 against 25, Bombay 33 against 24, and Assam 9 against 6. The jails of Berar and Coorg were free from cholera, and in the Punjab the deaths fell from 64 in 1888 to 3, and in Lower Burma from 105 to 89.

The following statement shows the sickness and mortality among all classes of prisoners in the jails and subsidiary jails of the several provinces for 1889, as compared with 1888:—

Provinces.	1889.			1888.		
	Ratio per 1,000 of Average Strength.			Ratio per 1,000 of Average Strength.		
	Admissions.	Daily Sick.	Deaths.	Admissions.	Daily Sick.	Deaths.
Bengal - - - -	1,304	46	45·78	1,383	46	44·71
North-Western Provinces and Oudh	786	31	28·03	786	30	28·33
Punjab - - - -	1,682	37	29·27	1,307	28	30·70
Lower Burma - - -	936	40	41·11	1,094	46	44·88
Central Provinces - - -	946	28	51·61	893	28	41·23
Assam - - - -	1,977	62	45·64	1,757	56	26·99
Coorg - - - -	1,760	50	29·82	1,713	52	41·53
Madras - - - -	646	25	38·53	680	24	25·50
Bombay - - - -	718	23	31·30	561	20	22·94
Berar - - - -	629	14	20·46	761	16	12·78
India - - - -	1,041	35	35·63	1,004	33	33·10

Bengal.

In accordance with the recommendations of the Jail Committee appointed by the Government of India to report on the general administration of the jails of India, steps were taken during 1889 for providing sufficient superficial area and capacity for each prisoner in the sleeping wards of the jails throughout the province of Bengal. Although, on the whole, there was ample accommodation, it was not found possible during the year to distribute the prisoners over the several jails according to their capacity, consequently there was some excess in a few of the jails, and in these the extra prisoners had to sleep in worksheds and other temporary structures. The returns of 1889 show an absence of any improvement in the health of the prisoners, which was attributed to those admitted during the year being greatly affected by want, owing to the unusually high prices of rice and other food grains. The rate of admissions into hospital was lower than in 1888, having fallen from 1,383 per 1,000 of average strength to 1,304; the daily sick-rate was the same (46), while the death-rate rose from 44·71 to 45·78. Of the total 688 deaths, 626 were of convicts, equal to a death-rate of 46·0 per 1,000 of average strength against 571 or 46·1 in 1888. Cholera was present in 22 of the 45 jails, and in some the mortality from the disease was high, chief among them being Cuttack, Dacca, Buxar, Mymensingh, Chittagong, Midnapore,

Rajshahye and the Presidency, which contributed 69 fatal cases, ranging from 5 to 13 in each. Altogether 117 convicts died from cholera, yielding a ratio of 8·6 per 1,000 against 9·6 in the previous year. During 1889 much attention was paid to the question of selecting sites for cholera or refuge camps for each jail, and every jail has now two sites, to which prisoners can be moved at once. The mortality from bowel complaints was also high, being nearly 17 per 1,000 of average strength. Excluding cholera, the death-rate among the convicts in jails only was 37·4 per 1,000. Of the other death causes, respiratory diseases yielded a death-rate of 4·8 per 1,000.

The jails with the highest mortality were the following :—

Jails.	Death-rate per 1,000 of Average Strength.		Jails.	Death-rate per 1,000 of Average Strength.	
	1889.	1888.		1889.	1888.
Julpigoree	179·4	41·1	Manbhoom	77·0	29·4
Chittagong	147·7	30·1	Purneah	76·3	104·6
Singbhoom	117·3	169·8	Dinagepore	75·5	63·8
Palamow	102·6	—	Sarun	68·2	31·9
Mymensingh	98·7	55·1	Poori	62·1	—
Hazaribagh	92·5	31·8	Lohardugga	56·9	191·3
Cuttack	84·4	20·0	Monghyr	56·2	32·6
Gya	80·0	114·7	Rungpore	55·0	173·6
Midnapore	77·2	44·5			

Omitting those jails which suffered from epidemic cholera already referred to, the Julpigorée jail, after three years of comparatively low mortality, again heads the list with a death-rate of 179·4, which does not appear to have been due to any want of care or attention to the sick. As regards Singbhoom, the Inspector-General explains that there is a difficulty in keeping prisoners belonging to the aboriginal races alive when they once contract disease in confinement. The high death-rate in this jail, and also in Palamow, was due to the small average population. In fact, the total population of the above three jails was only 136. In some measure the high mortality in the Hazaribagh jail was due to the transference of six prisoners while in bad health from the Palamow jail, and to their being grievously neglected whilst in transit. Both the Assistant-Surgeon in charge of the Palamow jail and the head constable who had charge of these prisoners, who were directly responsible for this mismanagement, were punished.

The health of the Gya jail caused much anxiety throughout the year, and in consequence of its high mortality in 1888 and first quarter of 1889 a committee was appointed to inquire into its causes; they attributed the deterioration to the general unhealthiness of the district. The jail is now reported to be quite healthy. Purneah and Dinagepore also show high death-rates, but both these jails receive prisoners from highly malarious tracts of country.

In five jails there were no deaths, and amongst the jails with the lowest mortality were all the first class central jails of the province with the exception of Midnapore. For nearly half the jail population the death-rate was below 30 per 1,000.

North-Western Provinces and Oudh.

There was slightly more sickness among the jail population of the North-Western Provinces and Oudh during 1889 than in the previous year, with a little lower mortality. The ratio of admissions into hospital per 1,000 of average strength remained the same (786), the daily sick-rate increased from 29·85 to 31·47, and the death-rate fell from 28·33 to 28·03. The 12 first-class jails, with over 500 prisoners in each, recorded an average death-rate of 41·80 per 1,000. Dysentery and diarrhœa and respiratory diseases were the chief causes of mortality. Cholera was present in eight jails, and was fatal in 44 cases. Though fevers caused by far the largest number of admissions to hospital they were fatal in only 36 cases. The most unhealthy jail was Allahabad District Jail, with 64 deaths, or 102·26 per 1,000. Of these, cholera accounted for 31, and of the remaining 33 deaths 19 were of prisoners in bad and indifferent health when first imprisoned. In six other jails the mortality ranged from 93·17 to 53·21, and in eight it exceeded 40 per 1,000. The mortuary statistics appear to have been vitiated to some extent by the large number of deaths among under-trial prisoners, owing to so many being in a moribund state on admission, in

consequence of injuries received outside of jail. Out of the 47 deaths among under-trial prisoners during the year 33 were admitted in a moribund state, and two died before admission to hospital. In future such deaths will be separated from the ordinary returns, and excluded from them in calculating the ordinary death-rate.

Amongst convicts the death-rate was in the proportion of 28·03 per 1,000 of average strength against 28·65 in 1888. The mortality was greatest amongst those who had passed from three to seven years in jail.

Punjab.

In the jails of the Punjab there was an enormous increase of sickness during 1889 as compared with the previous year, the ratio of admissions into hospital per 1,000 of average strength having increased from 1,307 to 1,682, and the daily sick rate from 28 to 37; but the increase appears to have been due to extra efforts on the part of Medical Officers to reduce the mortality in jails by admitting prisoners into hospital who in previous years would have been treated as out-door patients and not entered on the hospital registers. The result was, on the whole, satisfactory, as the death-rate was reduced from 30·70 per 1,000 in 1888 to 29·27 in 1889. The Inspector-General was convinced that with less careful medical supervision the mortality, especially in some of the unhealthy jails, would have been much greater than it was. In some jails, however, the mortality was very high, especially in those of Peshawar, Mooltan Central, Lahore Central, Jhelum, Dera Ismail Khan, Lahore District, and Amritsar, the death-rates of which varied from 69·11 in Peshawar to 42·81 in Amritsar. In the first-named an outbreak of typhus is reported to have been the cause of the unhealthiness, while in the Mooltan Central Jail, where the mortality was 52·02, a large number of old and infirm prisoners was collected to relieve the Lahore Central Jail. In the Lahore Central Jail the mortality fell from 57·68 to 50·33. The decrease was not considered satisfactory, as in 1888 the mortality was heightened considerably by cholera, whereas in 1889 the jail was free from that disease. More than a third (25) of the 68 deaths were caused by pneumonia. Great efforts have been made to make this a healthier jail, but without success. Other improvements, including water-supply, were about to be introduced. The high mortality in the Jhelum and Dera Ismail Khan Jails (47·89 and 46·98 respectively) was attributed to the unhealthiness of the season. In the small jails of Simla and Hoshiarpur there were no deaths, and in 10 other jails the mortality was under 15 per 1,000. The most fatal class of diseases was that of the respiratory organs, from which 168 prisoners died (nearly a half of the total mortality) against 130 in 1888. From bowel complaints the cases under treatment were considerably more numerous, but there were 18 fewer deaths, and the mortality ratio fell from 5·6 to 4·0 per 1,000, which is considered a proof of the fact that cases were taken into hospital which would in former years have received out-door treatment. Although cholera was present in 23 districts during the year, only three jails were affected, viz., Ludhiana with 5 cases and 2 deaths, Jullunder with 2 cases and 1 death, and Lahore Central Jail with one case not fatal.

Of the total 378 deaths 365 were of convicts, being in the ratio of 29·92 per 1,000 of average strength against 31·08 in 1888. Among convicts under six months in jail the death-rate rose from 23·54 to 26·24 per 1,000, but there was a considerable decrease in the proportion of deaths among prisoners from three to seven years in jail, viz., from 50·08 to 35·86.

Burma.

There was less sickness among the jail population of Lower Burma during 1889 and an appreciable decrease in mortality. The ratio of admissions into hospital per 1,000 of average strength fell from 1,094 in 1888 to 936, the daily sick rate from 46 to 40, and the death-rate from 44·88 to 41·11. Deaths from cholera decreased from 105 to 89. Of these 70 occurred in the Moulmein Jail and 8 at Ma-ubin. "The outbreak at Moulmein Jail," it is reported, "began at 12 o'clock on the night "of the 27th May, and was extremely sudden and violent. By 9 o'clock on the "morning of the 28th there had been 11 seizures and 3 deaths, and by the evening "of the same day 9 more attacks and 5 more deaths. During the day 489 out "of the 735 inmates of the jail were moved into camp. Next day 57 more men "were moved into camp; the number of seizures rose to 45 and the number of "deaths to 24. On the 30th the Chief Commissioner ordered the release of all "criminal prisoners who had less than three months to serve, all civil prisoners, and "certain political prisoners." The epidemic abated on the 1st June and ceased on the 11th, by which date there had been 108 seizures and 68 deaths. Cholera had been raging in the town for some time before the jail was attacked. Endeavours have been

made to induce the Municipal Committee to put the town into a proper sanitary condition, but as yet with little success. There was a satisfactory improvement in the health of the Rangoon Jail; there was less sickness and no cholera, and the death-rate declined from 30·87 in 1888 to 24·94. Of the total 370 deaths in the jails of Lower Burma 354 were of the convict class, representing a ratio of 41·10 per 1,000 of average strength.

In the 10 jails of Upper Burma also the health of the prisoners was better in 1889 than in the previous year, the daily average sick-rate having declined from 71·9 per 1,000 of strength to 47·31, and the death-rate from 88·89 to 77·39. There were only four deaths from cholera during the year, but 60 prisoners succumbed to bowel complaints, being nearly a third of the total mortality (193). There were 95 cases of beri-beri with 35 deaths. The high mortality of the jails of Upper Burma was attributed partly to the bad water-supply and partly to the exposure and hardship to which many of the dacoit prisoners had undergone before their admission into jail. Endeavours were being made to improve the water-supply. The death-rate per 1,000 of the average number of prisoners who had been less than six months in jail amounted to the high figure of 84·9 against 34·24 in Lower Burma.

Central Provinces.

In a year which was most abnormally unhealthy among the free population there was more than usual sickness among the prisoners of the Central Provinces. The ratio of admissions to hospital per 1,000 of average strength rose from 893 in 1888 to 946, the daily average sick-rate (28) remained the same, while the death-rate increased from 41·23 to 51·61. In the two largest central jails of the province, however, (Nagpur and Jubbulpore) there was a marked improvement both in sickness and in mortality as compared with the previous year, which was partly due to the prohibition to transfer weakly prisoners from district jails, and partly to the exercise of stricter medical supervision. The Nagpur Jail recorded a death-rate of 40·6 per 1,000 against 57·4 in 1888, and the Jubbulpore Jail 16·8 against 37·0. On the other hand, the figures of the Raipur Central Jail corresponded more closely with those of 1888, while in most of the district jails the larger number of sick and of deaths testified to the general unhealthiness of the year. The increase in the mortality of the jails as a whole was due to the cholera epidemic, which attacked nine of the jails, and was most fatal in Nagpur (19 deaths), Hoshangabad (11), and Sambulpur (20). Deducting the deaths from this disease (69), there remains only 166 as compared with 171 deaths among a smaller population in 1888. Of the total 235 deaths all but 10 were of convicts, the ratio being 51·81 per 1,000 of average strength against 42·61 in 1888. It is reported that, in accordance with the suggestions contained in the Report of the Jail Commission, the accommodation of all the jails has been recalculated, and except when cholera checks transfers there is no overcrowding. Ventilation is carefully attended to, and the effects of changes of temperature are guarded against. More attention is being paid to weighments: of 10,017 prisoners discharged during the year 5,693 had gained weight, while 3,169 had neither gained nor lost weight.

Assam.

The general health of the prison population of Assam during 1889 was far from satisfactory, and the increase in sickness and mortality was attributed to some extent to the unfavourable conditions which prevailed in the case of the general population, and which rendered the year a peculiarly unhealthy one in all parts of the province, the general causes at work having been aggravated by the continuous and almost unprecedented floods which prevailed in the Assam Valley from June to September. "At the same time," it is stated, "there can be no doubt that the health of the "convicts has been materially affected by preventable causes, such as the existence of "insanitary defects in some jails." The Chief Commissioner has directed that every effort should be made to correct the defects, especially those in connexion with bad water, drainage, and overcrowding. Among all classes of prisoners the ratio of admissions to hospital per 1,000 of average strength was 1,977 against 1,757 in 1888, the daily sick-rate was 62 against 56, and the death-rate 45·64 against 26·99. Of the total 72 deaths, all but two occurred among convicts, the ratio being 47·28 against 26·43. Nine of the deaths were due to cholera, 37 to dysentery and diarrhœa, and 6 to respiratory diseases. According to length of time passed in jail, more than half the deaths of the convicts (37) occurred among those under six months' imprisonment. Of a total number of 2,887 convicts discharged during the year, 637 neither lost nor gained weight, and 1,422 gained weight.

The health of the jail population of Madras Presidency during 1889 was very unsatisfactory. Admissions into hospital were less, but the average daily sick-rate increased from 24 to 25 per 1,000 of average strength, and the death-rate from 25·50 to 38·53. This high mortality was due to an outbreak of cholera which resulted in 110 deaths out of a total of 325. Omitting cholera, the mortality would be in the ratio of 25·49 or very nearly the same as in 1888. In the previous year there were only 12 deaths from the disease. Exactly half (55) of the cholera deaths occurred in the Coimbatore Central Jail, the ratio being 70·86 or over two-thirds of its entire death-rate. The mortality of the year was further swollen by the exceptionally high death-rates of the Trichinopoly, Parvatipur, Vizagapatam, and Berhampore Jails. In the case of the first two inquiry showed negligence on the part of the Medical Officers in charge who were censured and transferred elsewhere. In the other two jails, particularly that of Berhampore, the high mortality was due to the enfeebled state of the prisoners admitted, consequent upon the scarcity which prevailed during the year in the northern districts. But for these causes the year's death-rate would, it is stated, have been considerably below that of 1888. Of other diseases dysentery and diarrhœa also contributed greatly to increase the mortality. Madras.

Among the convict class the deaths numbered 284, representing a ratio of 38·28 per 1,000 of average strength. The greater number of these (109) took place during the first six months of imprisonment, principally in the Russellkonda, Berhampore, Vizagapatam, and Parvatipur Jails, where prisoners were admitted in a low state of health owing to the existence of famine in those districts.

Among the jail population of the Bombay Presidency there was a marked increase of sickness and mortality in 1889 as compared with the previous year. The ratio of admissions into hospital per 1,000 of average strength rose from 561 to 718, the daily sick-rate from 20 to 23, and the death-rate from 22·94 to 31·30. The total deaths amounted to 241, being an increase of 84 on the number of the previous year. The greatest mortality was due to respiratory diseases and bowel complaints. Cholera again appeared during the year, and was fatal in 33 cases against 24 in 1888. Some of the jails suffered rather severely from the disease, especially the Gokak Gang, which returned 13 deaths from it. The jails in which the mortality was highest, and much in excess of that of the previous year, and of the Presidency ratio of 1889, were: the Common Jail, Bombay, with a death-rate of 38·5 against 9·8 in 1888; Ahmedabad, 43·1 against 29·8; Gokak Gang, 43·3 against 29·6; Nara, 55·8 against 33·4; Aden, 57·6 against 16·1; and Hyderabad (Sind), 77·9 against 16·1. In the case of Aden the high ratio was merely due to the small average strength, the actual number of deaths being only three. The majority of the deaths (17 out of 22) in the Nara Gang took place during the first six months of the year, when the gang was camped on the Dimwah work, and was ascribed by the Medical Officer "to extremes "of heat and cold, unhealthy locality, poor water-supply, and insufficiency of vege-"tables in the diet, all conditions more or less inseparable from the existence of a "moveable gang." The abnormally high rate of mortality in the Hyderabad jail was attributed to the unhealthiness of the prisoners working extramurally on canal clearance, among whom pneumonia, bronchitis, and asthma caused 15 deaths out of a total of 51. In consequence of the strong opinions expressed against extra-mural labour, the whole subject was being considered by the Government. Bombay.

Among the convict class there were 222 deaths, equal to 31·9 per 1,000 of average strength against 23·2 in 1888. The increase in mortality was most marked among convicts in the first six months of their imprisonment, the number of deaths being 125 against 69 in 1888; while, on the other hand, there was a considerable diminution in mortality among those confined from two to three years in jail.

There was less sickness among the jail population of Berar during 1889 as compared with the previous year, but an increased mortality. The admissions to hospital were in the ratio of 629 per 1,000 of average strength against 761, the daily average sick-rate was 14 against 16 in 1888, and the mortality 20·46 against 12·78. There were no deaths from cholera or from any cause calling for special remark. Of the 22 deaths all but one occurred among the convicts, giving a ratio of 19·8 per 1,000 of average strength. One-half of the total deaths occurred among prisoners of under six months in jail, the inference being that they came into jail diseased. During the year 1,817 prisoners were discharged, and of these 1,175 gained weight and 307 neither gained nor lost. Berar.

V.—VACCINATION.

General results.

During 1889–90 there were 5,709,462 persons successfully vaccinated in the several provinces of India, being an increase of 68,495 on the number operated on in the previous year. According to age, nearly $2\frac{1}{2}$ millions of the total were of children under one year of age, and $2\frac{3}{4}$ millions were of children between the ages of one and six years. The proportion of population protected was equal to 25·75 per 1,000, which was made up of ratios ranging from 45·39 in Coorg to 16·09 in the North-Western Provinces and Oudh. The proportion was greater in five and less in five provinces than in 1888–89, the chief increase being in Coorg, where the ratio rose from 37·60 to 45·39 per 1,000 of population. In the vaccination of infants the best results were obtained from Berar, where 78 per cent. of the children born during the year (estimated at 40 per 1,000) were protected against small-pox. The Punjab came next with a percentage of success of 64, followed by Bombay Presidency with 58 per cent.

Bengal.

The vaccination returns for Bengal show a falling off in 1889–90 of 40,699 operations compared with the previous year, the total number having declined from 1,846,169 to 1,805,470. Of these, 1,758,425, or 99·18 per cent. were successful primary cases. In the vaccination of infants there was an improvement, but the proportion per cent. to total primarily vaccinated was only 16·20 against 14·78 in 1888-89, and of children between one and six years of age the percentage was 71·25 against 70·72. The small number of vaccinations performed in the province as a whole is attributed by the Superintendents of Vaccination to various causes, chiefly to the difficulty experienced by licensed vaccinators in realising their fees, and to paucity of subjects. "The latter cause," the Sanitary Commissioner says, "might have been operative in "a few local areas, but cannot be accepted as a valid excuse for deficient work in all "those places which are backward in this respect; for at the rate of 40 per 1,000, "the approximate correct birth-rate of India, the total average number of children "born during the three years 1887–90 in the entire area brought under the operation "of the Vaccination Department in Bengal numbered about 2,273,204, and deducting "from these the total average number of deaths among infants under one year "(238,244), the total average number available for vaccination each year was "2,134,960. But of these, an average of 266,100, or 124·63 per 1,000 only, an "extremely inadequate proportion, were so protected." Dr. Gregg reported most unfavourably of the animal vaccination depôt in Calcutta, but it is hoped that when the projected Darjeeling depôt is in working order the supply of animal lymph from the two depôts will be sufficient to enable the Bengal vaccine establishment to dispense with lymph obtained from the human subject. The attitude of the people generally towards vaccination is reported to be one of passive acceptance tempered apparently by a considerable but fortunately diminishing amount of passive obstruction. "What "the villagers seem most to object to is having to pay for the operation and the "using of some of their children as vaccinefers, this being attended by the discomfort "of having to carry their children to the neighbouring village, and other obvious "discomforts. As the years go on some progress undoubtedly occurs in the "popularizing vaccination, as the people come to regard it as the Government routine "to have the operation performed, and, to a certain extent, they now seem to "appreciate its benefits; but the protection of rural areas can never be placed on a "proper footing until the Compulsory Vaccination Act in a suitably modified form "be extended to them." The whole question was, however, under the consideration of the Vaccination Department, and a report on the subject was to be submitted to the Government.

North-Western Provinces and Oudh.

Satisfactory progress was made in the extension of vaccination in the North-Western Provinces and Oudh during 1889–90. Altogether 800,757 persons were vaccinated, which is an increase of 36,567 on the number of the preceding year. Primary operations numbered 785,957, with a percentage of success of 93·27, against 743,140 or 92·74 in 1888–89. Of the total successful primary operations 46·25 per cent. were children under one year of age, and 47·95 per cent. were children over one and under six years. The proportion of infants vaccinated to the number of births was again very low, amounting to only 16·84 per cent. A vigorous endeavour was made during the season

to extend vaccination in Oudh, and resulted in an increase of 32,823 operations. Much, however, yet remains to be done before the districts of Oudh can approach other districts in the provinces. But while, on the whole, the returns bear witness to improvement, an examination of the figures for individual districts discloses considerable retrogression in some since 1885–6, accompanied by an increase of deaths from small-pox. The Local Government intended calling the attention of the district authorities concerned to the matter. The Compulsory Vaccination Act was in force in several places, and the Lieutenant-Governor was of opinion that the time had come when in all the more important municipalities the Act should be introduced, and their attention was to be drawn to the subject with a view to the adoption of the necessary resolutions. In those in which the Act has been introduced, the measure, it is stated, has excited no opposition. The prejudice against vaccination is fast dying out, and it is believed that in towns it has lost all its vitality.

Punjab.

The total number of vaccinations performed in the Punjab during 1889–90 was 934,110, being 8,185 fewer than in the preceding year. The special staff vaccinated 34,297 fewer persons than in 1888–89. This falling off was attributed principally to certain vaccinators declining, on alleged religious grounds, to use animal lymph. Eventually, however, these men set aside their scruples, and agreed to use buffalo lymph. But this decrease of 34,297 was partly made up by the increase in the number of vaccinations performed by the District staff, who, with an addition of nine vaccinators to their number, performed 27,969 more vaccinations. Of the 934,110 persons vaccinated, 645,871 were primary cases, of which 95·73 per cent. were successful, being an increase of 0·60 on the percentage of 1888–89. Estimating the births at 40 per 1,000, about 64 per cent. of the infant population were vaccinated during the season. The ratio of persons successfully vaccinated in the province by the District and Special establishments was 40·13 per 1,000, which is a satisfactory improvement on 31·35, the corresponding average ratio for the five years 1884–85 to 1888–89. Statistics show that the amount of vaccination work done is, on the whole, increasing year by year, and is gradually reducing the mortality from small-pox. One of the principal reasons why the number of vaccinations was comparatively small, was the difficulty of obtaining fresh lymph. "Parents," the Sanitary Commissioner states, "are very unwilling to allow lymph to "be taken from their children, and, hence, work has at times been brought almost to a "standstill. This difficulty has been particularly felt among the higher classes. "They refuse to allow their own children to be used as vaccinifers, and object to take "lymph from the arms of low caste children. This difficulty is being obviated by "the introduction of vaccination with animal lymph, and the favourable results "obtained this year lead me to hope that, in a few years, arm to arm vaccination "will be almost entirely replaced by vaccination with animal lymph, and I trust that, "in consequence of this change, the number of vaccinations will soon be considerably "greater than it is at present." In the province as a whole, 246,105 vaccinations were performed with animal lymph, equal to over 26 per cent. of the total number vaccinated. Civil Surgeons report that the people generally prefer animal to human lymph. Inoculation as a remedy for small-pox is fast dying out, and the instruction of inoculators in the practice of vaccination, suggested by Sir James Lyall in 1887, is reported to have been followed with good results.

Burma.

There was a large and general increase in the number of persons vaccinated in Lower Burma during 1889–90. Including dispensary work the total operations amounted to 124,952 against 97,101 in 1888–89. Primary cases numbered 99,349, and of these 84·66 per cent. were successful, against a corresponding percentage of 85·6 in the previous year. Of children under one year 16,641 were successfully vaccinated, and between one and six years 51,626, both showing a considerable increase on the numbers of the previous year. As regards the attitude of the people towards vaccination the Sanitary Commissioner considers that there is now no opposition which cannot be easily overcome by energetic officers. During the year the Vaccination Act was extended to five towns, and at the close of the year it was in force in 10 towns and two cantonments.

In Upper Burma also the work of vaccination was considerably extended during the year. The staff of vaccinators was increased from 9 to 26, and among them they performed 29,707 operations, of which all but 77 were primary cases, with a percentage of success of 82·68. Better results would have been attained, but through the delay caused by having to train some of the vaccinators, and in some cases to those appointed failing to join, several months passed without anything being done. Besides the above, 3,534 persons were vaccinated in the dispensaries.

Central Provinces.

The vaccination returns of the Central Provinces for 1889–90 exhibit a considerable falling off in the total number of operations compared with the previous year. Altogether there were 411,276 persons vaccinated against 449,727 in 1888–89. But the actual decrease, after deducting the figures for Patna State in 1888–89, the returns for 1889–90 not having been received, was only 27,810. The number of primary operations was 364,909, with a percentage of success of 96·44, as compared with 411,591 and 95·90 per cent. (excluding Patna) in the previous year. Estimating the births during the year at 40 per 1,000, 47 per cent. were protected against small-pox. In some districts the decrease in primary operations was attributed to the low birth-rate of the year and to the heavy mortality of children under 1 year. But this explanation, the Chief Commissioner observes, "can only be accepted where "it can be shown that the total population requiring protection was worked up to, "and there seems reason to believe that in some districts it was partly due to neglect "on the part of the supervising agency to exact a full tale of work from the "vaccinating staff, and to the incompetency or misbehaviour of some of the vacci-"nators. The supply of lympth also appears to have failed. After allowing for the "prevalence of sickness in the province during the past year, the record of the year "points to need of improved handling of the existing staff."

Assam.

The total number of vaccinations performed in Assam during 1889–90 was 146,720, an increase of 12,582 on the number of the previous year. Of these 146,338 were primary vaccinations, of which 134,579 or 91·9 per cent. were successful. The above figures include 9,992 operations performed on tea-gardens, which shows an increase of 3,342 as compared with the results of 1888–89. All the districts except Cachar, Kamrup, and the Naga Hills showed an improvement, Sylhet being the most notable instance, the increase being 6,615 over the figures of the previous year. In the case of Cachar the decrease amounted to nearly 26 per cent., which was partly attributed to the weakening of the Vaccination staff from 18 in 1886–87 to 15 in 1888–89. The Deputy-Surgeon-General has been instructed to take measures for strengthening the staff if he found it to be necessary. The falling off in Kamrup from 15,868 cases to 12,872 was attributed to the very general and increasing prevalence of *kala-azar*, rendering the people on the south side of the Brahmaputra unfit subjects for vaccination, on account of the consequent tendency to axillary abscess, and also from the mortality among the Vaccinating staff from this disease. The special inquiries into *kala-azar* will, it is to be hoped, by indicating a remedy for it, remove this indirect effect of the scourge. The success of vaccination was also reported to be much interfered with in Sylhet, and in a less degree in Cachar, through the practice of inoculation. The Chief Commissioner applied to the Government of India for permission to introduce the Bengal Acts prohibiting inoculation, and rendering vaccination compulsory in certain localities of the Province adjoining Bengal. The subject was under the consideration of the Government of India.

Madras.

Satisfactory progress was made in vaccination work in the Madras Presidency during 1889–90. These operations, of which 94·9 per cent. proved successful, were 875,748. This was the largest number recorded for several years, and showed an increase of 61,758 successful cases as compared with the previous year. The successful primary vaccinations amounted to 817,307, the majority of which was, as usual, performed among children between one and six years of age. The successful vaccinations of children below one year of age represented a percentage of only 20·4 on the total live births during the year. Compulsory vaccination was in force in 25 towns, and it is satisfactory to note that the system has been well received by the people, and that in these instances the proportion of successful vaccinations on children under 1 year to registered births was 65 per cent. against 40 per cent. in other towns. The above figures are stated to exclude 17,582 operations performed by the Special staff in the Kurnool district in connexion with the small-pox epidemic which, being added, raises the total number of operations to 893,330. Vaccination by means of animal lymph was practised in all the districts but six, and it is observed that these six districts include four out of the five which showed an absolute decline in vaccination and two others in which methods of protection were extremely backward. The total number of operations performed with animal lymph was 101,153, with a percentage of success of 93·2 against corresponding figures of 42,445 and 94 per cent. in 1888–89. In all the above 17,582 cases performed in Kurnool by the Special staff animal lymph was used, each vaccinator having been supplied with a calf. Owing to the success of the experiment, the district board has now abolished *in toto* the use of humanized lymph, and adopted the new system.

In the Bombay Presidency 958,702 persons were vaccinated during 1889–90, being an increase of 7,608 on the number of the previous year. Of these, 900,232 were primary operations, 854,182 cases, or 94·88 per cent., being successful against a corresponding percentage of 95·02 in 1888–89. Estimating the births at 40 per 1,000 of population, the percentage of infants protected during the year was 58, and the proportion of persons of all ages protected to the total population was 33·35 per 1,000. The cities of Bombay and Poona were the only places where vaccination was carried on with animal lymph throughout the year, human lymph being in general use elsewhere. At several other places animal lymph was partially used. Owing to the municipality of Belgaum refusing to sanction funds animal vaccination in that town had to be discontinued at the end of the small-pox epidemic in 1889. Efforts were being made to introduce animal vaccination, as far as practicable, throughout the Presidency. Several vaccinators and candidates of the department as well as medical students received instruction in it. The Compulsory Vaccination Act has been in force in Bombay for 12 years and in Karachi for 10 years, and in both places there has been, since its introduction, a considerable increase in the number of infants protected. Bombay.

Owing to sickness among the vaccinators, the out-turn of vaccination work in Berar during 1889–90 was not so good as in the previous year. The total number of operations was 103,672 against 105,602. The decrease occurred entirely among primary cases as the re-vaccinations rose from 4,377 to 6,927. On the subject of the falling off in primary vaccination, the Sanitary Commissioner says: "In the last decade "four-fifths of the births, estimated at 40 per 1,000 of the population, have been "protected, so that primary vaccination must now of necessity fluctuate with the "number of infants in the community available for operation, and these in turn will "necessarily be influenced by a prosperous season and the absence of epidemic disease, "or the reverse." Of the 96,745 primary operations the percentage of success was 95·7 against 96·4 in 1888–89. Among those successfully vaccinated 82·7 per cent. were stated to be infants and 16·2 per cent. were children between one and six years. The rate of infantile protection varied from 92·5 in the Ellichpur district to 76·1 in the Basim district. These figures, however, are open to doubt, owing to serious discrepancies in the returns of infant vaccination from Wun, Ellichpur, and Basim, in which the number of children protected exceeded the number available for vaccination. But there appears to be no doubt that the percentage of infants successfully vaccinated stands higher in Berar than in any other province. The people as a whole are reported to appreciate the nature and work of the Vaccination Department, and, except in the larger towns, serious opposition is not now met with. To meet such cases the Sanitary Commissioner recommended the application of the Compulsory Vaccination Act. The Resident had already had this question under his consideration and was prepared to entertain proposals for adopting this course in such towns as might particularly require it. Berar.

VI.—MEDICAL INSTITUTIONS.

Civil Hospitals and Dispensaries.

The following comparative statement shows the number of hospitals and dispensaries open in the several provinces of India during 1889 and the previous year, and the number of patients under treatment:—

Provinces, &c.		Number of Institutions.	Number of In-door Patients.	Number of Out-door Patients.	Total Number of Patients.
Bengal	1889	261*	28,981	1,179,843	1,208,824
	1888	250*	25,751	1,106,700	1,132,451
Calcutta and Howrah	1889	7	24,330	197,210	221,540
	1888	7	22,612	231,094	253,706
North-Western Provinces and Oudh	1889	279†	51,705	2,588,388	2,640,093
	1888	262†	51,968	2,375,765	2,427,733
Punjab	1889	208	45,125	2,266,916	2,312,041
	1888	203	43,667	2,087,034	2,130,701
Lower Burma	1889	35	15,805	233,689	249,494
	1888	35	15,600	213,059	228,657
Central Provinces	1889	104	8,156	840,087	848,243
	1888	104	7,598	842,367	849,965
Assam	1889	64	4,158	255,724	259,882
	1888	62	3,466	221,005	224,471
Coorg	1889	3	502	15,719	16,221
	1888	3	396	10,093	10,489
Madras	1889	393	46,176	2,471,427	2,517,603
	1888	375	43,447	2,264,650	2,308,097
Bombay	1889	244	37,549	1,659,065	1,696,614
	1888	237	37,248	1,677,928	1,715,176
Berar	1889	44	2,773	270,439	273,212
	1888	43	2,383	254,416	256,799
Total	1889	1,642	265,260	11,978,507	12,243,767
	1888	1,581	254,136	11,284,109	11,538,245

* Statistics were furnished for only 255 in 1889 and for 249 in 1888.
† Statistics were furnished for only 250 in 1889 and for 238 in 1888.

Bengal.

The total number of dispensaries at work in Bengal during 1889 was 255, or five more than in the previous year. The establishment of six other institutions was sanctioned, but as they did not open during the year the statistics of only 255 were given. The attendance of both in-door and out-door patients increased, the former from 25,751 in 1888 to 28,981, and the latter from 1,106,700 to 1,179,843. The increase is attributed to some extent to the number of dispensaries that were newly opened, "but it also affords evidence," the Inspector-General says, "of a growing desire on the part of the poorer classes to avail themselves of the benefits they confer." He, however, considers the figures smaller than they ought to be when the large population of the province is taken into account, the percentage of persons treated being only 1·73. On the subject of in-patients, he remarks: "The numbers, "although increasing, are very small when compared with those which obtain in other "parts of India; and I fear it must be admitted that the poorer classes in Bengal do "not sufficiently appreciate the benefits which can be had from in-door treatment in "dispensaries. The native of India, when sick, prefers to be treated at his own house,

" and at such a time will not leave his family if it can possibly be avoided—a " characteristic which seems to be more strongly marked in Bengal than elsewhere. " The desire is only natural, and he cannot be blamed for it; but it seems to me that " one cause of it is to be found in the very limited provision of separate accommoda- " tion for the families of patients at dispensaries, and this is a point well worth the " attention of municipal committees and others interested in these institutions. In " the Punjab and North-Western Provinces many of the dispensaries have a few rooms " apart from the main building which are reserved for the accommodation of well-to- " do patients and those who bring relatives with them, and they are largely taken " advantage of." The Lieutenant-Governor hoped to see the above proposal carried out, as he had no doubt the defect pointed out was a serious one. The death-rate among the in-patients was high, 139 per 1,000 against 127·7 in 1888 and 127·1 in 1887, and was attributed to the large number of starving and moribund cases, and the very small proportion of persons suffering from trifling ailments who were admitted for treatment. Malarial fevers were as usual the most common cause of application for relief, and in the year under notice accounted for nearly one-fifth of the total cases under treatment. Malarial fevers, in the opinion of the Inspector-General, are not more prevalent in Bengal than in other Indian provinces, "but they have this peculiarity," he says, " that they are usually of a more severe and fatal type, which is probably due " to the damp, relaxing nature of the climate. They leave their traces behind in the " form of anæmia, enlarged spleen, diarrhœa, and dysentery, and it has truly been said " that if the prevalence of malarial fever could be abolished, one-half the diseases of " the country would disappear with them." All but 57 of the 255 dispensaries had cases of leprosy under treatment. There were, however, only 2,635 patients, " which " is probably accounted for by the fact that medical treatment fails to do more than " palliate some of the symptoms." In discussing the question of leprosy, the Inspector-General remarks: " There can be no doubt that the establishment of leper retreats all " over the country would do much good, by affording the wretched sufferers places to " which they could resort and remain in comparative comfort, while at the same time " the feelings of the public would not be so often shocked by the loathsome sights " which are now too common in the streets and thoroughfares." He is further of opinion that some diminution of the disease might be effected by careful segregation, and suggests that a trial might be given to the measure in selected localities. In surgical operations there was a satisfactory increase, the total having risen from 58,328 in 1887, and 60,956 in 1888, to 66,324 in 1889. Major operations rose from 4,622 in 1888 to 5,336, and of these a very large proportion (nearly 70 per cent.) was performed by Assistant Surgeons. The Inspector-General considers that nothing is more calculated to create confidence in these institutions than successful surgery, and the progress made in this direction is certainly satisfactory.

There was a considerable falling off in the attendance at the Calcutta and Howrah Hospitals, as shown in the following table :—

Medical Institutions.	1889.				1888.			
	Total Treated.			Died per 1,000 of treated.	Total Treated.			Died per 1,000 of treated.
	In-door.	Out-door.	Total.		In-door.	Out-door.	Total.	
Medical College Hospital	6,665	50,182	56,847	89·82*	6,194	45,800	51,994	102·1*
General Hospital	3,190	—	3,190	39·81	2,968	—	2,968	37·39
Mayo Institutions	2,278	137,419	139,697	126·86	2,833	174,769	177,602	97·42
Campbell Hospital	8,252	—	8,252	203·95	6,497	—	6,497	215·94
Municipal Police Hospital	2,432	—	2,432	8·22	2,735	—	2,735	10·96
Total Calcutta Hospitals	22,817	187,601	210,418	119·91*	21,227	220,569	241,796	115·82*
Howrah General Hospital	1,513	9,609	11,122	217·44	1,385	10,525	11,910	247·63
Grand Total	24,330	197,210	221,540	126·13*	22,612	231,094	253,706	124·05*

* Reckoned on cases treated exclusive of cases treated in the ophthalmic ward of the Medical College Hospital.

It will be seen, however, that the decrease occurred entirely among out-patients, which was chiefly due to the inaccuracy of the returns furnished by the Mayo hospitals in 1888, and the adoption of a new rule under which these institutions and the Howrah Hospital are closed on Sundays. The increase in the number of in-door patients was very marked, especially in the Campbell Hospital, which is mostly resorted to by pauper and famine-stricken patients. There was a considerable falling off in the number of women and children treated in the various institutions, which was accounted for in a great measure to the successful management of the Lady Dufferin Hospital.

Among the in-patients the death-rate was 126·13 per 1,000 against 124·05 in 1888. The results of the surgical operations were satisfactory. The number of the major kind rose from 1,719 to 1,926, and that of minor operations from 20,264 to 20,933, and the death-rate after operation was only 39 per 1,000 against 46 in the preceding year.

North-Western Provinces and Oudh.

During 1889 there were 279 dispensaries of all kinds open compared with 262 in 1888. Statistics have only been furnished for 250, and at these 2,640,093 persons obtained relief, which shows a marked improvement on 2,427,733, the number to whom relief was afforded in 1888. The increase was entirely of out-patients, for among in-patients there was a slight falling off from 51,968 in 1888 to 51,705. It is noticed that although the attendance of in-patients only decreased by 263, there was a fall of 6,313 in the number of patients cured, of 475 in the number relieved, and a rise of 142 in the number of deaths. Altogether there were 3,040 deaths, which gives a ratio on the total in-patients of 58·8 per 1,000 against 55·8 in 1888. Of the diseases for which the patients were treated, fevers continued to hold the foremost place, representing 17·38 per cent. of the whole; diseases of the skin followed with 13·44 per cent.; diseases of the digestive system, including diarrhœa and dyspepsia, 12·89 per cent.; cases of ulcer 7·8 per cent.; and diseases of the lungs and respiratory system 6·64 per cent. Satisfactory progress was made in the amount of surgical work performed. Major operations have steadily increased year by year, and showed an advance of 17 per cent. since 1886. Since then also the cures have increased by 20 per cent., the reliefs by 12 per cent., and the deaths by 13 per cent.

Out of the 250 institutions which furnished returns, 12 were female hospitals. In these 2,910 in-patients and 104,849 out-patients were treated, and among them 4,194 surgical operations were performed, of which 934 were of a major kind. With regard to these latter the Inspector-General remarks: "It is but right that I should state " that the large majority of them have been done by the Civil or Assistant Surgeons, " and this is right generally. The greater part of them are of a nature unconnected " with the sex of the sufferer. I have myself seen women insist that the operations " shall be done by the male doctor; and not only that, but that they shall be done in " the male hospital, so as to make sure of his operating. As already stated, the " principle of management in this connexion is that, as far as we are concerned, every " woman should be left to be a free agent in the selection of the particular division of the " hospital in which she shall be treated. There is still in every male hospital a ward " or two available where women can be treated with the same amount of privacy as " before the Dufferin hospitals began to be established. Having made their choice of " the male hospital, their sex is treated there with the same respectful solicitude as " before."

Punjab.

Five new dispensaries were opened in the Punjab during 1889, bringing the total number of dispensaries and hospitals up to 208 as against 203 in 1888. Altogether 2,312,041 patients were treated in the year under notice as compared with 2,130,701 in the preceding year. There was, therefore, an increase of 181,340, which shows a growing appreciation of these institutions. "But it nevertheless cannot yet be said," the Local Government remark, "that the means of obtaining medical relief are every-" where adequate to the wants of the people. This is particularly the case in the rural " tracts, and more so in some districts than in others, and it is hoped that District " Boards and Municipal Committees will gradually be brought to value properly the " benefits which must accrue from the provision of suitable and readily accessible " medical institutions." The in-patients numbered 45,125 against 43,667 in 1888, and of these 31,092 were cured and 2,138 died, the rate of mortality to total treated being 47·4 per 1,000 against 56·3 in the previous year. There was a decrease in the number of cases treated for cholera, small-pox, and several other diseases; but on the other hand there was a large increase in cases of malarial fever, diseases of the respiratory system, diseases of the eye, skin diseases, and ulcers. On the subject of malarial fevers, the Inspector-General says: "Although the numbers treated last year (419,168) " are the highest which have yet been recorded, and though the increase may be " welcomed as a sign of the advancing popularity of our dispensaries, yet I fear they " represent but a small portion of those who suffer from malarial disorders. Nearly " half a million of deaths are recorded by the Sanitary Commissioner to have been due " to fevers of all kinds during the year 1887, and this will give an idea of the large " number of people who suffer from these maladies, and how inadequate our present " system of medical relief is to cope with this wide-spread form of disease. The " attendance at all our dispensaries last year (1889) for fever does not equal the

" number of deaths from this single cause in 1889." The great prevalence of malarial fever in water-logged tracts formed the subject of special inquiry, and with a view to alleviate the wide-spread suffering caused by it, steps were being taken for the supply of quinine at such prices as would be within the reach of the very poor. While recognising the value of a plentiful supply of iron and quinine in such localities, the Local Government thought it possible that more lasting benefits might be derived from the restricted use of canal water, and this question was under consideration. Surgical operations of a major order continued to show an increase. The number performed during 1889 was 11,900, being 1,637 or over 16 per cent. greater than in 1888. Minor operations declined from 152,520 to 151,535.

Burma.

The same 35 dispensaries were in operation in Lower Burma in 1889 as in the previous year, but the attendance increased from 228,657 to 249,494. Of these 116,887 or 46·85 per cent. were Burmese, which is a satisfactory increase on the percentage of 45·98 treated in 1888. In-door patients increased from 15,600 to 15,805, and of these 12,195 were cured and 1,266 or 80 per 1,000 died, against 1,476 deaths or 94·6 in 1888. The year's work shows a decrease in the number both of major and minor operations performed, the former having fallen from 370 to 323, and the latter from 7,315 to 6,868. The Burmese Assistant Surgeons and Hospital Assistants recently appointed are reported to be doing good work. Their influence, the Local Government observe, will no doubt do much to extend among their countrymen a feeling of confidence in European methods.

During the year 37 dispensaries were in operation in Upper Burma, and the number of patients who attended them amounted to 70,146, of whom 4,409 were in-patients, and 65,737 were out-patients. The Burmese resort to these institutions in considerable numbers, the proportion being 61 per cent. of the total. Eighty-one major and 1,030 minor operations were performed during the year.

Central Provinces

There were 104 hospitals and dispensaries at work in the Central Provinces during 1889, the same number as in the previous year; but the total number of patients decreased by 1,742, viz., from 849,965 to 848,243. The decrease was confined to out-patients, as there was an increase of 558 in the in-patients, and was attributed partly to the prevalence of cholera, which is believed to have checked the movement of villagers. In-patients rose from 7,598 to 8,156, and among them there were 1,063 deaths or 130·3 per 1,000, a ratio 32·1 higher than in 1888. As already stated, the year was an unhealthy one, and this is further shown by the increase in cases of malarial fever from 175,887 in 1888 to 195,732, and of cholera patients from 237 to 6,038; cases of dysentery also rose from 14,418 to 19,310. There were 20,052 surgical operations performed against 21,656 in 1888. Although on the whole there was a decrease of 1,604 surgical operations, major cases rose from 974 to 1,056. Some of the Medical Officers are reported to have done excellent work in this direction.

Assam.

The number of dispensaries open in Assam during 1889 was 64, an increase of two on the previous year. In these, 259,882 persons sought relief, of whom 4,158 were in-patients, and 255,724 were out-patients, against 3,466 and 221,005 respectively in 1888; there was therefore a total increase of 35,411 patients. These results the Sanitary Commissioner considered satisfactory, as showing increased attendance and benefit to the people of the province and others from their existence, and the good done by them. Among the in-patients there were 853 deaths, being in the ratio of 205·1 per 1,000 as against 188·7 in 1888. Of the several diseases from which the patients suffered, fevers accounted for more than a fourth of the total attendance; next came diseases of the skin, worms, diseases of the digestive system, rheumatic affections, and spleen diseases, all showing an increase compared with the figures of the previous year. In the number of surgical operations performed there was also a satisfactory improvement. Major operations showed an increase of 97 cases, the figures being 545 against 448 in 1888.

Madras.

In the Madras Presidency the number of civil hospitals and dispensaries in operation during 1889 increased from 375 in 1888 to 393, and the number of patients from 2,308,097 to 2,517,603. There was thus an increase of 209,506 cases, which was attributed partly to the greater number of medical centres at work, and partly to the popularity that the institutions have steadily gained, and the better appreciation by the natives of European treatment. The unhealthiness of some districts also contributed somewhat to raise the number seeking relief, especially under fevers and

bowel complaints. The in-patients numbered 46,176, and of these 29,256 were cured and 7,543 were relieved, while 3,232 died, the latter being in the ratio of 69·9 per 1,000 against 67·8 in 1888. The returns showed a slight increase under small-pox and cholera (83 and 134 respectively), and a large increase (14,931) in the number of cases of malarial fever as compared with the previous year. The cases of syphilitic affections also rose from 28,855 to 30,742, which was attributed in great measure to the introduction of the voluntary system of treatment in the Voluntary Venereal Hospital. The number of surgical operations performed was 86,501 against 73,176 in the preceding year. Of these, 5,123 were major operations against 4,960 in 1888, the fatal cases being in the proportion of 5·1 and 4·7 per cent. respectively.

Bombay. The number of civil hospitals and dispensaries at work in the Bombay Presidency during 1889 was 244, being an increase of seven on the number of the previous year; but this increase was accompanied by a decrease of 18,562 in the total number of patients, which was mainly due to a healthy season. Including 37,549 in-patients, 1,696,614 persons received medical relief during the year. Of the in-patients 25,068 were cured, and 3,011, or 80 per 1,000 to the total treated, died, against 81 per 1,000 in 1888. Malarial fevers as usual headed the list of diseases from which relief was sought, and the number of cases rose from 245,697 in 1888 to 262,791; on the other hand there was an enormous decrease of 54,258 cases of skin diseases, the number having fallen from 280,748 to 226,490. Cholera and small-pox cases were comparatively few in number; the former decreased from 7,833 to 5,318, and the latter rose from 741 to 944; venereal diseases gave 30,028 or 1·7 per cent. of the total treated, against 28,785 or 1·6 in the previous year. The number of surgical operations performed was 90,440, of which 5,297 were of a major kind, and of these 4,440 were cured, and 179 or 33 per cent. were fatal.

Berar. One new dispensary was added in 1889 to the 43 open in Berar in the previous year. The number of in-patients was 2,773, and of out-patients 270,439, being an increase of 390 and 16,023 respectively compared with the figures of the previous year. Of the in-patients 2,378 were cured and 154 died, which gives a death-rate of 55 per 1,000 of total treated, against 42 in 1888. The deaths occurred chiefly amongst patients who were admitted for cholera and other bowel affections, and amongst those admitted in a moribund state. That the public health was very indifferent in 1889 is borne out by the statistics of diseases treated, cholera, malarious fevers, dysentery, and diarrhœa having been more prevalent than in either of the two previous years. Cholera apart, the Inspector-General observes, the prevalence of malarious fevers and bowel complaints indicates in a general way the health of the population. Out of the total increase of 16,413 sick during the year, fevers and bowel complaints together represented 94 per cent., or 25·1 per cent. of the total sick treated. There were 230 major and 7,937 minor surgical operations performed as against 218 and 7,203 respectively in 1888.

Lock Hospitals.

Bengal. The returns of the four lock hospitals in Bengal for 1889 show a marked increase of venereal disease amongst European troops. At Barrackpore the average strength during the period of occupation was 327, and the number of admissions for venereal diseases was 218 or 666·6 per 1,000, against a ratio of 165·0 in 1888. The average strength of European troops stationed at Dum Dum during 1889 was 858, and the number of admissions for venereal diseases was 366 or 426·57 per 1,000 against 126 or 269·23 in 1888. The working of the present Act at this station is reported as very unsatisfactory; few or none of the women presented themselves for examination, while many who had the disease were prostituting at the station. Among the troops stationed at Darjeeling, average strength 262, there were 116 admissions, equal to 419·84 per 1,000 against 216·71 in 1888, and 341·91 in 1887. The ratio of 1887 is given as affording a more correct comparison than that of the preceding year, the institution being worked as a voluntary lock hospital during the latter part of 1888. The increase at this station is attributed partly to the large number of coolie women who practise prostitution clandestinely and uncontrolled within the cantonment and its vicinity. The admissions into the Dinapore lock hospital during 1889 were in the ratio of 616·22 per 1,000 of an average strength of 631 against 198·83 in 1888.

North-Western Provinces and Oudh. The voluntary system of lock hospitals was in force throughout 1889 in the North-Western Provinces and Oudh. Venereal disease prevailed much more extensively

among the European troops than in the previous year, and at most of the stations there was an excessive increase in the ratios of admission. There was also a larger and increasing amount of suffering and unrelieved sickness among the women. The average strength of the garrison troops during 1889 was 14,753, and the ratio of admissions was 581·6 per 1,000 as compared with 391·8 in 1888, and 313·1 of the five preceding years, and 278·2 the ratio of the five years previous to the opening of the lock hospitals. "These lamentable figures," the Local Government remark, "cannot "fail to arrest the attention of the Government of India, indicating as they do a "marked increase in the unpreparedness of British troops in case of war, and greater "cost hereafter contingent on the effects of disease on so large a scale in weakening "and undermining the constitutions of the men concerned." Of the 18 lock hospitals Shahjahanpur headed the list with the enormous ratio of 878·9, Naini Tal followed with 816·1, and Meerut, Agra, and Allahabad, with ratios of over 700. Excessive rates as compared with the average were also returned by Bareilly, Benares, Ranikhet, and Moradabad, while Lucknow, by far the largest garrison in the provinces, recorded only 422·6, which, however, exceeded the ratio of the preceding five years by 106·9 per 1,000. The average number of women who attended for periodical examination was only 271 against 603 in 1888, showing that during the year under notice there must have been a large amount of suffering and unrelieved sickness among the prostitute class.

Punjab.

The results of the working of the 16 lock hospitals in the Punjab during 1889 show that venereal disease among the European troops had increased to the extent of 7 per cent. as compared with the previous year, and 13 per cent. as compared with 1887 when compulsory measures were in force. The Inspector-General of Hospitals says: "An increase of 13 per cent. in the admission-rate as result of the working of the "voluntary system, if it can be ascribed to such, is a very grave and unsatisfactory "condition of things, as it means an addition to previous numbers of 6,500 non-"effectives from this cause in 50,000 men. Whatever may be thought of compulsory "measures, they had the merit at all events of keeping venereal disease under some "sort of control, but there is actually nothing in the present system to check its "growth." Among an average strength in 1889 of 15,222 the admissions numbered 5,960 or 391·60 per 1,000 against 321·10 in 1888, and 255·06 in 1887. The increase, however, was not general at all stations, but was confined to nine, the largest increase, 273 per 1,000, being at Subathu. Meean Meer, Rawal Pindi, and Sialkot also showed increases of 50 per cent. and over as compared with the previous year. Of the remaining seven stations which showed a decrease, Attock, Nowshera, Dagshai, and Peshawar returned the largest; the first of these has recorded the lowest ratio of admissions for three years, but it is too small a station for its statistics to be of much value.

Central Provinces.

There were only three lock hospitals at work in the Central Provinces during 1889, that of Kamptee having been closed in April of the year under review.

The returns of the three hospitals show a marked increase in venereal diseases among European troops as compared with those of the two previous years. The following were the ratios of admission per 1,000 of strength:—

	1887.	1888.	1889.
Jubbulpore	378	494	498
Pachmarhi	150	474	626
Saugor	320	394	567

The number of women attending the periodical examinations is reported to have considerably decreased since attendance became voluntary, but less so in Jubbulpore than in the other two.

Madras.

As a result of the working of lock hospitals in Madras Presidency on the voluntary system of registration and examination, the number of women under treatment declined from 2,584 in 1887, and 1,692 in 1888, to 118 in 1889; and it is reported that "the average stay of each case in hospital has nearly doubled in comparison with "former years, an indication of the severity of disease existing among those voluntary "seeking admission."

Among European troops the admissions into the lock hospitals for venereal diseases are reported to have increased by about 50 per cent. compared with the average of the previous four years, and primary syphilis, which in its after effects produces such

an amount of inefficiency and invaliding, had proportionately increased to a greater extent than the milder forms of venereal affections. The ratio of admissions at the seven stations where lock hospitals were established was 457·17 per 1,000 of average strength in 1889 against 356·41 in 1888 and 352·23 in 1887. The station ratios varied from 358·49 in Cannanore to 558·73 in St. Thomas' Mount. Speaking of the general results, the Surgeon-General of Her Majesty's Forces, says: "It is apparent that there "has been an enormous increase of venereal disease at every station with the exception "of Cannanore, the garrison of which is very small. This increase has, as before "observed, been particularly marked in cases of primary syphilis, and dates from the "time when compulsion ceased at these stations. It is idle to hope that venereal "diseases, which have so grave and far-reaching effects as far as the British soldier in "India is concerned, can be held in check without the re-introduction of the Contagious "Diseases Act or some satisfactory modification of it. The maintaining of lock "hospitals on the present voluntary system is expensive without producing any "adequate return. As a rule, only those seek admission whose condition is one of "extreme disease, and absolutely precludes them from carrying on their occupation."

Bombay.

Among the British troops in the Bombay Command there were 6,251 admissions into hospital from veneral diseases during 1889, being in the ratio of 484·49 per 1,000 of the average strength against 358·40 in 1888 and 255·52 in 1887; this latter ratio was, therefore, less by 228·97 per 1,000 than the year under notice. These figures, the Principal Medical Officer, Her Majesty's Forces, Bombay, observes, plainly show that since the abolition of the rules for the compulsory examination of women, &c., venereal disease is increasing enormously. According to stations, the highest ratio was returned by Ahmednagar, 1041·43 per 1,000; Ahmedabad followed with 864·75; Khandalla with 746·83; Satara, 726·36, and Kirkee with 706·25; eight other stations returned ratios between 402·99 and 592·59; the remainder varied from 81·08 to 388·78. Owing to the voluntary attendance of the women being so small, several of the lock hospital establishments were ordered to be reduced from April 1889 to the lowest scale consistent with requirements, while the hospitals at Kamptee, Hyderabad, and Karachi were closed during the year.

Lunatic Asylums.

Bengal.

At the five asylums in Bengal 1,204 lunatics, including 247 fresh admissions, were under treatment in 1889, being an increase of 44 on the number of the previous year. In the course of the year 92 patients were discharged as cured, 33 as improved, and 5 otherwise discharged. Of the new admissions 26·72 per cent. were reported as due to the use of ganja or other preparation of Indian hemp, and 7·69 per cent. to spirit drinking. As regards the health of the inmates, the admissions into hospital considerably exceeded those of the previous year, the number having risen from 390 to 627. The increase in some measure was due to the somewhat greater unhealthiness of the season generally, but mainly to the inclusion for the first time of all out-door cases. The mortality rose from 79·3 per 1,000 of average strength in 1888 to 89·4, the increase being largely due to the heavy death-rates in the asylums at Patna and Berhampur, viz., 95·9 and 128·8 per 1,000 respectively. In the case of Patna it was suggested that the dampness of the wards in connexion with the repairs might have had something to do with its unhealthiness, and at Berhampore it was attributed to the defective sanitary condition of the asylum and to some extent to overcrowding.

The criminal lunatics under confinement numbered 526, of whom 96 were fresh admissions and 12 re-admissions. By the close of the year the number was reduced to 440 by 53 discharges and transfers, and 33 deaths. The Inspector-General, Dr. Hilson, in his report for 1889, calls attention to the large yearly increase in the criminal population of the asylums. He points out that in the course of 10 years the admissions of this class of lunatic has exceeded by 164 the total discharges and deaths. He notices also that, although the criminal population of the asylums has been rising more or less in the past six years in all parts of India, except the North-Western Provinces, the increase in Bengal has reached a magnitude not yet attained elsewhere, and he predicts that if the present rate of increase continues a few years longer one-half of the lunatics in the asylums will belong to the criminal class. The Local Government requested him to follow up the question, and ascertain in what respect the rules of admission and discharge of criminal lunatics in other parts of India differ from those in force in Bengal.

In the Bhowanipore Asylum, containing European and Eurasian patients only, the population was slightly smaller than in 1888 (45 against 50), and the proportion of

recoveries declined from 46·8 per cent. of average strength to 15·9 per cent. The Superintendent accounts for the decrease by the admission during the year of a larger number of females, who more frequently suffer from the chronic and incurable forms of insanity. The general health of the patients was very good, there was no epidemic sickness of any kind, and only one death, which occurred from sub-acute mania, ending in serous apoplexy.

North-Western Provinces and Oudh.

The daily average population of the four asylums (Agra, Bareilly, Benares, and Lucknow) in the North-Western Provinces and Oudh during 1889 was 1,009, or 2 less than in the previous year, The new admissions fell from 348 in 1888 to 289, which was due to the fact that the orders of the Government as to the class of persons who should be admitted had been more carefully attended to. To avoid overcrowding, harmless criminal lunatics are now confined in central prisons. By the close of the year 534 of the total patients had been discharged as cured, and 81 died, the deaths being in the proportion of 80 per 1,000 against a ratio of 115 in 1888. The diseases which proved most fatal to the inmates of the asylums were bowel complaints and anæmia and general debility; while fever added to these diseases accounted for by far the largest proportion of the admissions to hospital. Cholera was present only in the Agra asylum, where there were 12 cases with 4 deaths. About a half (506) of the lunatics were employed during the year either in factories attached to the asylums or in gardening. The profits realised by their labour continued to show a steady increase, and in the year under notice amounted to Rs. 4,297.

Punjab.

The total number of lunatics under treatment in the two asylums (Delhi and Lahore) in the Punjab during 1889 was 450, of whom 95 were fresh cases, and 5 were re-admissions. By the end of the year the population was reduced to 333 by 74 discharges (55 as cured) and 43 deaths. Seventy-six of the inmates were criminal lunatics, 19 of whom were admitted during the year. In both asylums the admissions to hospital were fewer than in 1888, but in Lahore the number of deaths was very high, 37 against 13, the death-rate being 146·9 per 1,000 against 50·6. At Delhi the deaths fell from 14 or 150·4 per 1,000 in 1888 to 6 or 62·3. The Lahore asylum was visited by an epidemic of cholera, resulting in 7 deaths, but this did not account fully for the large increase in the number of deaths. The Inspector-General intended instituting inquiries into the matter, and the Lieutenant-Governor of the province suggested that he should consider whether, when a change next occurred in the appointment of Civil Surgeon of Lahore, it would not be possible and advisable to transfer the charge of the lunatic asylum to a medical officer with less demands on his time, such as one of the Professors of the Medical College.

Lower Burma.

The lunatics under confinement in the Rangoon lunatic asylum during 1889 numbered 333, of whom 96 were fresh admissions and 4 were re-admissions; but of these 100 admissions only 56 were Burmese. At the end of the year the number of inmates was reduced to 258 by the discharge of 58 (39 as cured) and 17 deaths. The asylum enjoyed excellent health throughout the year, there having been no sickness of importance except what was presented by the patients who eventually died. The death-rate was equal to 70·1 per 1,000 of average strength against 130·1 in 1888. Eleven out of the 17 deaths were of patients admitted into the asylum since the beginning of 1888.

Central Provinces.

The total number of inmates in the Nagpur and Jubbulpore asylums of the Central Provinces during 1889 was 325 or 9 more than in the previous year. Of these 48 were fresh cases, and 5 were re-admissions. In the course of the year 18 patients were discharged, 12 as cured and 54 died. The year generally was an unhealthy one, and the admissions into hospital at both the asylums were greater than in 1888, especially at Nagpur, while the mortality was about three times higher. Nagpur asylum recorded 33 deaths, equal to 254·7 per 1,000 of its average strength, against 12 or 91·2 in 1888, and Jubbulpore 21 or 151·6 against 7 or 49·5. Cholera accounted for 8 deaths at Nagpur, but, as in the previous year, most of the deaths were due to general debility and anæmia, and to fevers. The Nagpur asylum had been free from cholera since 1883, when there was one case. This asylum was visited during the year by the Surgeon-General with the Government of India. With a view to the improvement of the general health of the patients, alterations were being made in the structure of the buildings, additional warm clothing for the rains and cold was supplied to the patients, and the utmost attention was paid to their diet. Cholera,

though prevalent to some extent in Jubbulpore town, did not attack the asylum. Of the 21 deaths 7 were from sheer old age and 9 from anæmia and general debility.

Assam. The Tezpur lunatic asylum, Assam, had a population of 120 in 1889, an increase of 12 on the number of the previous year; 33 were new admissions and 4 were re-admissions. Seven patients were discharged during the year, 5 as cured, 7 died, and 3 escaped, leaving 103 still under treatment at the end of the year. With a view to prevent the number of escapes, and in order to provide for the maintenance of proper discipline in the asylum, the construction of two additional solitary cells and of a ward for the confinement of criminal lunatics was sanctioned. It is intended to erect a masonry wall round the asylum as soon as funds are available. There was more sickness among the patients than in 1888, but the death-rate fell from 83 to 73 per 1,000 of average strength.

Madras. At the three lunatic asylums in the Madras Presidency, viz., Madras, Vizagapatam, and Calicut, there were 792 insanes under treatment during 1889, of whom 145 were fresh admissions. Compared with the previous year the population was three less. The aggregate number discharged as cured was 109, the same as in 1888. As regards sickness and mortality, the admissions into hospital were a little more numerous than in the previous year, and the death-rate considerably higher, and this notwithstanding that the asylums were free from any epidemic, except a single case of cholera in the Madras asylum. The most common ailments were dysentery and diarrhœa. There were in all 51 deaths against 39 in 1888, being in the proportion of 79·2 and 60·4 per 1,000 of average daily strength respectively. The increase in the death-rate was chiefly due to the heavy mortality in the Madras Asylum, where the deaths rose from 33 to 43, which the Superintendent reported as being caused by deficient drainage and contaminated water-supply in the female enclosure of the asylum. Every precaution was taken, but the Superintendent believed that until the well was finally closed it would always be a source of danger. Pipe-water was, however, being introduced, and better results are expected. There were no deaths in the Vizagapatam asylum, such an occurrence not having been known for 25 years, the average annual death-rate for that period being 62 per 1,000. This is the more satisfactory as the year was an unhealthy one in the district, cholera, diarrhœa, and dysentery having prevailed in an epidemic form. Out of the total population of 792, the causes of lunacy were known only in 390 cases, of which 262 were due to physical and 128 to moral causes. The criminal lunatics numbered 159, of whom 17 were admitted during 1889. At the end of the year there remained 143 in confinement, 12 having been discharged and 4 having died.

Bombay. The total number of lunatics under treatment in the six asylums in the Bombay Presidency during 1889 was 917 (or 32 less than in 1888), of whom 230 were new admissions and 12 were re-admissions. By the close of the year the population was reduced to 714 by the discharge of 136 patients and 67 deaths. Of those discharged all but 21 were wholly or partially cured. In 379 cases the insanity was attributed to physical causes, and in 92 to moral causes, while in 446 cases the cause was unknown. Amongst physical causes, 207 cases were due to the use of intoxicants. The general health of the patients was better than in 1888, and the death-rate fell from 126·6 per 1,000 of average strength to 95·4. Of the 67 deaths 16 were due to diarrhœa, 13 to epilepsy, 12 to dysentery, and 10 to pneumonia. Altogether there were 131 criminal lunatics under confinement, 30 being fresh cases against 123 in 1888. By the discharge of 9 and the death of 10 there remained at the end of the year 112 insanes of this class in the asylums.

Medical Schools.

Bengal. The total number of medical students in Bengal at the close of the session of 1889–90 was 1,016 (including 54 females) against 999 in the previous year. On the opening of the session in the Calcutta Medical College, 148 students resumed their studies, 8 rejoined, and 78 new students were admitted, making a total of 234 against 227 in 1888–89. At the close of the session the number was reduced to 149. As regards the examinations, 7 candidates (besides 4 who passed the First L.M. examination) passed the First M.B. examination, 6 candidates (including 2 females) passed the Second M.B. examination, and 20 candidates passed the First and 13 (including 1 female) the Second L.M.S. examination. Of the 27 female students in the college, 23 attended the special certificate class, 11 of whom obtained the license to practice medicine and surgery.

The Campbell Medical School had 243 pupils (including 22 females) on its rolls. Out of 74 second-year students who appeared for the first license examination 47 (including 10 females) passed. For the second or final license examination, all but 10 of the 87 candidates were successful and obtained certificates. Of the 82 first year students 71 (including 9 females) received promotion. At the Dacca Medical School there were 173 pupils on the rolls at the close of the session. At the first license examination 21 of the 42 second year students were promoted to the third year, and at the second or final license examination there were 5 failures out of 52 candidates. The Temple Medical School had 135 students on its rolls at the close of the session. Of the 30 third year students who appeared for the final license examination 25 passed, and of 45 second year students 41 passed and 3 were recommended for re-examination. Six candidates appeared at the compounders' examinations and 4 passed. At the Cuttack Medical School there were 69 students on the rolls at the close of the session. For the first license examination 19 students (including 3 females) presented themselves, of whom all passed except 3 males, and for the final license examination 8 candidates out of 16 passed.

North-Western Provinces and Oudh.

The number of students under instruction at the Agra Medical School during 1889–90 was 229 against 196 in the previous year. Of these 44 were females, being an increase of 5 on the number of 1888–89. In the male section, the course of study extends over four years, except in the case of pupils of the military class, who receive in their second year instruction which the others receive spread over their second and third years. During the four years' course four examinations are held, two of the nature of ordinary class examinations, and two at the end of the second and fourth years respectively, by passing which students obtain first admission to the final examination, and, finally, either Government service or diplomas. The results of the examination of private pupils were again unsatisfactory, and rules were about to be issued which will render the production of a certificate of having passed the Anglo-Vernacular or Middle Class examination, a condition precedent to the admission to the school of a pupil of this class. Out of 15 private pupils in the third class 6 failed to pass the intermediate examination, and 4 private pupils in the second class had to be warned that unless they made decided progress they would have to be dismissed. At the final examination of the first or senior class all of the 10 military students, all of the 15 civil students with one exception, and all of the 3 private students, passed and obtained their diplomas. In the examination of the junior "first half" professional examination 19 out of 22 military students and 18 out of 19 civil students passed. The Punjabi students are reported to have specially distinguished themselves.

In the female section of the school 10 of the 44 pupils obtained diplomas, and were likely to make useful practitioners. The examination passed by the class of which they were members compares creditably with the corresponding class of male students. The Provincial Dufferin Fund Committee continued its efforts to promote female medical education, and to secure a sufficient supply of candidates for the several classes of female medical practitioners.

Punjab.

The attendance at the Lahore Medical College and School rose from 254 in 1888–89 to 300 in 1889–90. Of these 106 (including 4 females) were in the College or English class, and 194 (including 9 females) were in the school or Hindustani class. The results of the examinations were satisfactory, and showed a distinct improvement on those for 1888–89. In that year only 50 per cent. of the junior students in the College passed their examination, and only 75 per cent. of the senior class, whereas in 1889–90, 70 per cent. of the junior and 83 per cent. of the senior students passed successfully. "It is gratifying to think," the Inspector-General of Hospitals observes, "that this result is due to a more thorough acquaintance with the subjects taught." In the School the results were not quite so good as in the previous year, the percentage of students who passed as Hospital Assistants and Native doctors having declined from 93 to 83. A noteworthy incident was the successful completion of the training of the first female student of the College, Miss H. Connor, the first female who obtained the diploma of Licentiate of Medicine and Surgery of the Punjab University in April 1889, and who unfortunately died a few months afterwards.

The Principal of the College reports: "On the whole, the close of the year under "review finds the College and School in a very satisfactory condition; the attendance "of students at both has increased by leaps and bounds during the past few years,

" and the standard of education now imparted to members of the Assistant Surgeon " Class falls little short of that given in English schools of medicine."

Madras.

The strength of the Madras Medical College in 1889–90 was 136 or 13 less than in the previous year. In the senior department 12 were students for the M.B. and C.M. degrees, and 114, including 5 females, for the L.M.S. degree. On the whole, the results of the University examinations held in July 1889 were not satisfactory. One candidate passed for the first and one for the second M.B. and C.M. degree. At the First L.M.S. examination 11 candidates passed out of 57 sent up, these poor results being attributed to the low standard of the matriculation examination. For the second L.M.S. examination, 7 (including 1 female) passed out of 17 candidates. The second and junior departments had 175 pupils, including 38 females, on the rolls. In the former department, military and female students, colonial apprentices, and passed hospital assistants, numbering 47 in all, were being prepared for the college diploma of apothecary. The 4 female students that appeared at the final examination passed, with 1 in the first class. Out of 24 students who appeared at the primary examination, 16, of whom 7 were females, passed. For the final examination in the junior department 35 candidates presented themselves, of whom 29 were successful.

The Local Fund Medical School, Nellore, had 16 pupils on its rolls or 1 less than in 1888–89. Seven students appeared at the examination for Hospital Assistants, and 5 passed, all in the second class. The Prince of Wales' Medical School, Tanjore, had a strength of 18 against 31 in the previous year. Only 3 pupils were presented at the last examination for Hospital Assistants, of whom 1 passed in the first class and 2 in the second class.

Bombay.

The attendance at the Grant Medical College, Bombay, decreased from 182 at the close of the session of 1888 to 162 (including 32 females) at that of 1889. The classes made fair progress, though the insufficient general education of the students was against them. At the first University examination in medicine there were 83 candidates, of whom 41 passed; 6 of them, including 2 women, being placed in the first class; for the second examination 24 candidates out of 62 passed, of whom only 1, a female, was placed in the first class. For the L.M.S. degree there were 73 candidates, of whom 32 passed, 8 of them coming out in the first class. Three women passed their final examination in the Certificated Practitioner's Class. One soldier's wife and 6 nurses, including a Parsi and a Hindu, were trained and passed for diplomas as midwives.

At the Government Medical Schools at Poona, Ahmedabad, and Hyderabad, there were 182 pupils. At the final examinations 25 pupils were found qualified as Hospital Assistants.

VII.—SANITARY WORKS.

Bengal.

Works were in progress at Calcutta to remedy the scarcity of water in riverside and other districts; a survey for the drainage of the Suburbs was undertaken, and a sum of Rs. 2,46,572 was expended on the structural improvement of bustees (or clusters of Bengali huts). Two new loans, one of 5 lakhs for water-supply, and one of 14 lakhs for water-supply and drainage, were raised during the year. The number of persons at Calcutta supplied with filtered water was 480,019, which includes 75,800 in the suburban amalgamated area, and the supply had reached 35·4 gallons per head, in addition to 8·9 gallons of unfiltered water. The total cost to the town on account of water-supply had reached Rs. 1,42,72,897. The extension of the water-supply to the Suburbs of Calcutta was being pushed on with great rapidity, and "already," the Health Officer of Calcutta reports, "those portions of the suburbs which have been "supplied and those portions within reach of the water-supply have already improved "in health owing to this measure."

The total sanitary expenditure incurred in the municipalities of the interior of Bengal during 1889 was Rs. 12,81,031, representing 43·34 per cent. of their income, an excess of Rs. 1,50,950 compared with the amount expended in 1888. The increase was spread over every head, but chiefly on conservancy and water-supply. Nearly all the 147 municipalities spent a fair proportion of their incomes on sanitary works of an annually recurring nature, and on municipal expenditure proper, but only 19 appear to have spent a fair proportion on original sanitary works. In many districts private individuals assisted with contributions towards improving the sources of water-supply and the execution of other sanitary works for the public benefit. "On the whole," the Sanitary Commissioner remarks, "Municipal Commissioners are "doing what they can to improve the sanitary condition of their towns, but although "a good deal has been done and is being done, I am again compelled to remark that "in many cases municipal income is wasted on temporary works and on works of "minor importance, while works of a more needed, substantial, and lasting nature, "such as drainage, water-supply, and public latrines, are neglected." During the year, however, several municipalities applied for loans in order to undertake important works of permanent sanitary improvement, and the Lieutenant-Governor again assured Municipal Commissioners that such applications would always receive the most favourable consideration from Government. But the total of loans raised by municipalities up to the close of the year was less than three lakhs of rupees. Owing to the want of funds, the District Boards had not been able to carry out any sanitary improvements in rural areas, but the means and agency by which such reforms might be executed were under the consideration of the Government. Good work was done by the Sanitary Commissioner in inspecting municipalities and in preparing schemes for their sanitation.

A Sanitary Board, consisting of Sir Henry Harrison, Member of the Board of Revenue, as President, and Colonel McNeile, Chief Engineer and Secretary to Government in the Irrigation Department, and Dr. Gregg, the Sanitary Commissioner, as members, and a whole-time officer was to be placed at the disposal of the Board as Sanitary Engineer. The Sanitary Board will be the executive agency through which the Government will act in the Sanitary Department, and it is hoped that, if judiciously worked, it will exercise a powerful initiative and a valuable control in all departments of sanitary work.

North-Western Provinces and Oudh.

Among the more important sanitary works initiated and carried out in the North-Western Provinces and Oudh during 1889 were the waterworks at Agra, Allahabad, and Benares. The works at Agra were completed at a cost of Rs. 11,60,000, and the working charges will be Rs. 40,000 per annum. The water will be taken from the Jumna, and the works are designed for a supply in the first instance of 15 gallons a head to a population of 100,000, but admit of extension; it is supposed that the demands at starting will not exceed a million gallons a day. The Allahabad water-works were commenced at the close of the year, and rapid progress was being made with them; the estimated cost is Rs. 15,40,000, and the working charges Rs. 1,50,369 a year. The water will be pumped from the Jumna, and the yield is put down at 20 gallons a head of population in the civil station and 15 gallons in the city. It is expected that the works will be completed some time this year (1891). The Benares water scheme was also commenced during 1889, and the mains are expected to deliver 25 gallons per head of the gross population of the town in six hours. A scheme for

supplying Cawnpore with pure water was in preparation. In most of the other municipalities some expenditure was incurred in conservancy and certain minor improvements. In his remarks on the sanitary condition of towns with a population of 10,000 and upwards, the Sanitary Commissioner says: "Drainage is everywhere "defective. In some towns a system obtains with fairly good outfalls, but in most "towns the drains are irregularly constructed, and in many instances the outfall is "into tanks in the centre or populated parts of the town. In many towns the house "and latrine drains communicate directly with open surface drains, scarcely, if ever, "or very irregularly, and in very few instances regularly flushed, so that nearly the "whole of the urine and a certain portion of the excreta pass into street and lane "drains to undergo fœted decomposition." During the year, a Sanitary Board was constituted for the provinces, and held several meetings. The Local Government is stated to have already received material and valuable help from its deliberations. The Government of India have expressed their satisfaction at the interest displayed by the Lieutenant-Governor in sanitary reform, and at the impetus which has under his direction been given to sanitary work throughout the united provinces.

Punjab.

The most important sanitary works undertaken or in progress in the Punjab during 1889 were schemes for the water supply and drainage of the large cities and towns of the province. Progress was made with the Delhi waterworks and the conservancy tramway, and although expenditure was incurred in the construction of drains and watercourses, a thorough scheme for the draining of this populous city has yet to be taken in hand. The waterworks at Peshawar were approaching completion. At Rawalpindi a main was constructed for the distribution of water from the new waterworks to a portion of the city. Drainage schemes for the towns of Jullundur and Ludhiana were in progress. At Gujranwala Rs. 44,559 were expended on the extra-mural drainage scheme of the town and outfall channel. At Amritsar progress was made in filling up the city ditch, and an extra-mural drainage channel (19 miles in length) was completed; the water-supply scheme for the city was still under consideration. Since the close of 1889 a scheme has also been prepared, and the necessary funds provided, for supplying the cantonment and civil station of Abbottabad with good water, the want of which has been long felt by the inhabitants. The municipal expenditure on sanitation was Rs. 983,370, or about 21½ per cent. of gross income, against Rs. 932,043 or 22 per cent. in 1888. The amount realised from the sale of manure and town sweepings in 1889 was Rs. 113,535, against Rs. 105,221 in the previous year. The expenditure on water-supply and cleansing tanks exceeded that of 1888 by Rs. 76,136; but much yet remains to be done in the way of supplying most of the large cities and towns of the province with pure water, and the Lieutenant-Governor hoped that this most important matter, vitally affecting the health of the population, would receive from municipal committees the attention which it urgently demanded. The Sanitary Commissioner observes that sanitary improvements in municipal towns are being introduced very slowly, the common cry being that no funds are available. "It is very difficult," he says, "to get members of municipal "committees to take an active interest in sanitary measures. There does not seem to be "much difficulty in raising considerable sums for building ornate municipal halls, "but when they are asked to spend money on schemes for the improvement of "sanitary defects the money difficulty is very prominently brought forward." Very little progress was made in improving the sanitary condition of the villages. While on tour during the cold weather the Sanitary Commissioner did all he could to impress on zaildars and the lambadars of villages the importance of carrying out simple sanitary improvements which would require very little expenditure of money.

Burma.

Few sanitary works of any magnitude were undertaken or were in contemplation in Lower Burma during 1889. The new drainage works in Rangoon were formally opened by H.R.H. Prince Albert Victor of Wales in December 1889. The expenditure on the works during the year amounted to Rs. 13,19,938, and the reclamation of land east of the town cost Rs. 23,266. The project of the sanitary survey of municipal towns which the Government of India ordered to be taken up had not reached the stage of actual work. The selection of an engineer was, however, under consideration, and it was hoped that the matter would be finally settled and the work soon commenced. The Sanitary Board had not found it possible to start any definite scheme of rural sanitation; but by the Village Act of 1889 which was being put into force throughout the lower province, village headmen would be provided with an agency for the purpose. But though few large sanitary works of a permanent character were

undertaken, considerable attention was paid by municipalities and local authorities to minor improvements, such as the removal of surface impurities, the cleaning of surface drains, and the protection of sources of water-supply from contamination. The expenditure by the Public Works Department on sanitary works in Lower Burma during the year was Rs. 83,660, of which Rs. 43,228 were spent on markets, and Rs. 12,382 on water-supply. In Upper Burma the expenditure by the Department on different items of sanitation amounted to Rs. 1,01,927, of which Rs. 35,905 were for hospitals, Rs. 26,045 for latrines, and Rs. 10,896 for water-supply.

Central Provinces.

In the Central Provinces the extension of the water-supply of Nagpur City was the only sanitary work of any great importance undertaken during the year. This work was approaching completion, and its cost was covered by a loan from provincial revenues. The Burhanpur waterworks were being re-modelled at the cost of the municipality, and schemes for the water-supply of Harda, Khandwa, and Raipur were under consideration. Minor sanitary improvements were also carried out in the majority of the larger towns of the province. In improving the water-supply of the districts 235 wells were repaired, and 218 were constructed. The expenditure incurred in the 19 headquarter towns of the province on sanitary measures, including vaccination, amounted to Rs. 1,83,084, being in the proportion of 24·4 per cent. of their income. As regards village sanitation, the Chief Commissioner of the province is satisfied that a great deal of quiet improvement is being effected year by year in many villages. "The knowledge of what the district officer expects," it is observed, "is now universal; and even if villages only get one thorough cleaning out annually "in anticipation of his visit, that of itself is something." By the Village Sanitation Act the Chief Commissioner is empowered to enforce some amount of sanitary reform in those larger and more flourishing villages where the population and the means of the inhabitants will permit of the raising of sufficient funds for local improvements; and in the case of smaller villages the issue of rules under section 141 (2) of the Central Provinces Land Revenue Act is expected to be productive of much good in improving sanitation. During the year the Chief Commissioner issued orders relating to the sanitation of municipal towns, with the result that much has already been done in the way of improvement. Under the same orders a Sanitary Board, consisting of the Sanitary Commissioner and the Superintending Engineer, was constituted to prepare a plan of operations for a general sanitary survey of all municipalities, which appeared to the Chief Commissioner to be the first step required in the initiation of a regular programme of hygienic reform. In time, every town in the province will be surveyed on a large scale, careful levels will be taken, and definite schemes of water-supply, drainage, and conservancy will be worked out, to be carried into effect as funds become available.

Assam.

No sanitary works of any magnitude were undertaken in Assam during 1889, but active measures were taken to improve the sanitary condition of towns and villages. With regard to towns and markets, full instructions have been issued to district officers, and detailed schemes have been drawn up, which will be carried out as soon as funds become available. In the case of rural areas also a beginning has been made in consultation with the Sanitary Board of the province, and grants in aid have been distributed from provincial funds to such local boards as needed them. The expenditure on works connected with sanitation by the several municipalities increased from Rs. 7,948 in 1888 to Rs. 98,681 in 1889. "It would, of course," it is stated in the Resolution of the Local Government, "be incorrect to say that what has been actually "done in the direction of improving sanitary arrangements, whether in urban or rural "areas, sufficiently meets the actual requirements, which can only be gradually "supplied as funds become available and circumstances permit, but it is certainly the "case that substantial progress has been effected during the year under report, and "the Chief Commissioner will make it his business to see that this progress is "maintained and enlarged in all practicable directions."

Madras.

In Madras Municipality nearly 8½ miles of drains of all sizes were constructed, and steps were being taken to repair and reconstruct parts of the Black Town drainage works. The supply of water from the Red Hills Lake was at the rate of 18 gallons per head for nearly three-quarters of the population, but the water proved on analysis to be worse than it was in 1888. This unsatisfactory result was attributed to the continued drainage into the lake of the villages on its western and southern slopes. The Government thought that if such was the case, the removal of the villages in

question was very desirable, and that the matter should be considered in connexion with the new scheme for improving the water-supply. The works for this scheme had not been begun, but a special octroi duty was about to be imposed on tobacco to meet their cost.

In Madras Presidency no sanitary works of any great importance were carried out during the year by either municipalities or district boards. The scheme for supplying the town of Cuddapah with water from the Bugga springs was in progress. The Sanitary Commissioner reports that both the water-supply and drainage of the greater number of towns are far from satisfactory, but that schemes for some towns have been prepared. Hitherto the absence of professional engineering advice has operated as a hindrance to the execution of projects of this nature; but it is expected that the recent appointment of a Sanitary Engineer will be followed by a great improvement in the water-supply and drainage of municipal towns. Of their total income the municipalities set apart 32 per cent. for sanitation against 34 per cent. in 1888. In rural circles the only works of any importance which were taken in hand during the year were drainage and conservancy schemes for the town of Nandigal in Kurnool. Many minor sanitary improvements were carried out by the various District Boards. The total amount set apart by them for sanitation was in the proportion of 38 per cent. of income.

Bombay. In the Municipality of Bombay satisfactory progress was made during 1889 with the Tansa water-supply projects. At the commencement of the year works to the value of Rs. 16,40,000 had been executed, and at the end of the year the value of work done was Rs. 32,60,000. The total length of tunnelling completed by the end of the year was 13,070 feet, and the whole of the land for the lake and the greater part of that for the duct had been acquired. The low level of the water in the Vehar Lake in October 1889 gave rise to fears of a failure of the water-supply. A scheme for bringing water to the town from the Pawai Valley was accordingly undertaken, and by July 1890 the works connected with it were so far completed as to enable the Pawai water to be utilized. There were 978 new water connexions made during the year, bringing the total up to 16,898. The Health Officer of Bombay City, in his report, brings to notice the great want of some system of drainage for the outlying districts of the city. New towns, he says, are springing up, houses being built in every direction, but no drainage having been provided the houses stand in pools of foul sewage. An exhaustive inquiry into the sanitary requirements of the town in respect of sewerage and drainage has, however, been made by an eminent Sanitary Engineer, Mr. Latham, and his report was under the consideration of the Government of Bombay.

The district municipalities of Bombay expended about a half of their income for 1889–90 on matters connected with public health, and a third of this expenditure was devoted to conservancy. The sanitary works executed during the year were few and unimportant. The scheme for improving the Sudder Bazaar drainage of Poona was under construction. The Ahmedabad waterworks which were commenced in March 1889 were making fair progress and since the year under report have been opened. A drainage project for the Ahmedabad Municipality had been prepared and was under revision. The Viramgam Municipality sanctioned the preparation of a project for waterworks, and the scheme was under the consideration of the Public Works Department. A drainage scheme for Nadiad was also under preparation by the same department. A water-supply project for Surat was under consideration. A commencement was made with the Dedargaon waterworks in Dhulia. The Acting Commissioner of the South Division of Bombay Presidency says: "From what I have "seen of the towns in the districts above Ghats, their sanitary condition is generally "behind that of towns in the Konkan or Deccan. The abominable pit privies seem "in general use in all large towns, and there is a great deficiency of public "conveniences. Not one town (above Ghats) has a really satisfactory water-supply."

erar. No important sanitary works were undertaken in Berar during 1889. "All the municipalities, except Khamgaon," it is reported, "are hard pressed for funds, and "the large schemes for improved water-supply and drainage in Akola and Amraoti "which have been contemplated for years past are blocked for want of money." The extension of the Amraoti City waterworks was carried on during the year at a cost of Rs. 30,000, and a sum of Rs. 16,493 was spent in the construction of concrete drains for the town of Murtazapur. The Public Works Department also spent over Rs. 25,000 on minor sanitary improvements. The expenditure incurred by the municipalities on improving drainage, water-supply, and conservancy, amounted to Rs. 91,529 or 45·3 per cent. of their estimated income of Rs. 2,01,712. The total district expenditure

(excluding municipalities) incurred on works of sanitary improvement was Rs. 1,02,213 against Rs. 1,05,476 in 1888. Instead of a provincial Sanitary Board a system of district and village boards has been introduced, whereby a Sanitary Board has been formed at the headquarters of each of the seven districts, and a Village Sanitary Committee, the members of which have been selected under the personal supervision of the Deputy Commissioner, has been appointed in 1,535 villages. Another measure of importance is the preparation of a record intending to show the condition of the water supply of all places in the province at which large annual fairs are held, and the measures considered necessary for the removal of existing defects.

Military.

Bengal. The total expenditure on military sanitary works in the Bengal Presidency during 1889-90 was Rs. 60,74,202 or Rs. 4,60,840 more than in the previous year. Among the principal works completed or in progress during the year were the following: At Quetta buildings for two battalions of British Infantry and for a mountain and two garrison batteries of Royal Artillery, besides quarters for officers, were provided. At Loralai three wells in the Native Infantry lines and the officers' quarters and officers' mess were completed. At Jhansi, Muthra, and Peshawar several barracks and auxiliary buildings were in progress. At several other stations hospital buildings and hut barracks were finished or in progress. Improvements to drainage at Hastings, Calcutta, were carried out. A water-supply for troops at West Ridge, Rawal Pindi, was commenced and almost finished. Numerous other improvements in the erection of minor buildings for the accommodation of troops, in road making, water-supply, erection of cattle sheds, &c. were carried out during the year.

Madras. At several stations in the Madras Command, new barracks, hospitals, and other buildings for the health and comfort of troops were either completed or were in course of construction during 1889-90. At Malapuram the scheme of additional barrack accommodation was finished at a total cost of Rs. 1,78,758. Increased attention was paid to the sanitation of Native Infantry lines at Bangalore, Bellary, Secunderabad, and Trichinopoly. At Bangalore the drainage of the Pioneer lines was about a third completed. Various sums were spent in repairing and otherwise improving military lines, and at several stations other minor sanitary improvements were carried out.

Bombay. The actual cost of military works connected with sanitation in the Bombay Command during 1889 was Rs. 67,937. The sanitary condition of cantonments continued to receive careful attention, and works recommended on sanitary grounds by Administrative Medical Officers were carried out as far as funds were available. The drainage of the cantonment and Sudder Bazaar of Baroda was completed at a cost of Rs. 27,029. The surveys for the improvement of the Sirur water-supply, and for the Poona cantonment bazaar drainage scheme were finished. A sum of Rs. 13,120 was spent on various original waterworks for the troops at Poona and Kirkee. Two new barracks at Colaba were occupied during the year. In several other instances improvements in water-supply and drainage and in minor matters were effected.

India Office,
27th August 1891.

W. T. Ronson.

ABSTRACTS.

OF

SANITARY AND OTHER REPORTS

FOR

1889.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA.

(Surgeon-General W. R. Rice, M.D.)

European Troops.

The general health of the European Army of India was, according to the following table, less satisfactory in 1889 than in the previous year, the admission, daily sick, death, and invaliding rates being all higher, and the daily sick and death-rates quite unusually high :—

Abstract of Statistics of European Troops in India for the last ten years 1880 *to* 1889, *and for the ten-year period* 1870–79.

Year.	Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Daily Sick.	Deaths.	Invaliding.	Total Loss.
1870–79	577,416	1,475	60	19·34	43	62
1880*	51,796	1,789	·74	24·85	26†	51†
1881†	58,728	1,605	70	16·86	38	55
1882	57,269	1,445	65	12·07	33‡	45
1883	55,525	1,336	63	10·88	33	44
1884	54,996	1,513	67	12·56	32	44
1885§	56,967	1,533	71	14·55	23	37
1886§	61,015	1,514	75	15·18	21	36
1887§	63,515	1,370	70	14·20	23	37
1888‖	68,887	1,382	71	14·84	23	38
1889	69,266	1,498	86	16·60	26	43

* Excluding troops serving in Afghanistan. † Including troops in Afghanistan.
‡ Calculated on the strength obtained from Annual Returns. § Excluding troops on active service in Burma.
‖ Excluding troops in Burma for the first three months of the year.

The chief causes of admission were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases which caused increased admission were venereal diseases (482 per 1,000 against 371), enteric fever (23 per 1,000 against 14), and ague (334 per 1,000 against 316). Among those from which admission was lessened were cholera, simple continued fever, dysentery, and scurvy. Venereal diseases caused 32 per cent. of the total sickness, and ague 22 per cent.

The chief causes of mortality were enteric fever, heatstroke, hepatic abscess, and cholera. Among the diseases which caused increased mortality were enteric fever (6·11 per 1,000 against 3·75), small-pox, ague, remittent fever, heatstroke, bowel complaints, circulatory diseases, and phthisis. Among those from which mortality was lessened were cholera, and hepatic and respiratory affections. Enteric fever caused 37 per cent. of the total mortality, against 25 per cent. in the preceding year.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, hepatic inflammation and abscess, palpitation, valvular disease of the heart, tubercle of the lungs, malarial affections, mental disorders, dysentery, and injuries.

In the European Army of Bengal the admission, daily sick, death, and invaliding ratios were all increased, the daily sick and death ratios the most unusually so. At the same time cholera mortality was diminished.

European Army of Bengal.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Daily Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79 - -	363,431	1,522	61	4·18	16·82	21·00	41	62
1880* - - -	31,583	1,813	75	4·84	22·89	27·73	22†	50†
1881* - - -	35,901	1,729	72	3·23	13·82	17·05	37†	54†
1882 - - -	35,164	1,579	69	1·28	11·89	13·17	35	48
1883 - - -	34,079	1,463	66	0·94	10·27	11·21	31	42
1884 - - -	33,486	1,662	70	1·34	10·34	11·68	32	44
1885 - - -	35,031	1,661	73	1·17	11·99	13·16	20	33
1886 - - -	38,784	1,559	73	0·64	14·88	15·52	18	34
1887 - - -	40,601	1,426	69	2·27	12·56	14·83	19	33
1888‡ - - -	42,858	1,398	71	2·10	13·57	15·47	20	36
1889 - - -	42,821	1,517	87	0·84	15·23	16·07	24	40

* Excluding troops in Afghanistan. † Including troops in Afghanistan.
‡ Excluding troops in Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases which caused increased admissions were venereal diseases (491 per 1,000 against 373), enteric fever (26 per 1,000 against 16), and remittent fever (11 per 1,000 against 4). Among those from which admission was lessened were simple continued fever, ague, hepatic and splenic affections, and scurvy. Venereal diseases caused 32 per cent. of the total sickness, and ague 21 per cent.

The chief causes of death were enteric fever, hepatic abscess, and heatstroke. Among the diseases which caused increased mortality were enteric fever (6·68 per 1,000 against 4·15), remittent fever, diarrhœa, and circulatory diseases. Among those from which mortality was lessened were cholera (0·84 per 1,000 against 2·10), and respiratory diseases (0·58 per 1,000 against 1·03). Enteric fever caused 42 per cent. of the total mortality against 27 per cent. in the preceding year.

The chief causes of invaliding, were in order, debility, palpitation, valvular disease of the heart, mental and hepatic affections, tubercle of the lungs, syphilis and gonorrhœa, malarial affections, skin diseases, and injuries.

The health of the European Army of Madras, as may be seen from the following table, was bad. The admission, daily sick, and death ratios were all much increased, the invaliding ratio increased, the cholera mortality diminished. The very high daily sick, and death-rates point to the occurrence of severe cases :—

European Army of Madras.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Daily Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79 - -	110,396	1,264	60	1·68	16·01	17·69	49	67
1880 - - -	10,310	1,368	64	0·10	10·08	10·18	20	30
1881 - - -	10,391	1,160	60	1·73	9·24	10·97	28	39
1882 - - -	11,020	1,058	57	0·82	9·43	10·25	24	34
1883 - - -	10,498	1,013	59	0·95	9·24	10·19	33	43
1884 - - -	10,785	1,109	57	0·93	7·60	8·53	32	40
1885* - - -	10,519	1,154	66	0·19	8·94	9·13	24	33
1886* - - -	11,181	1,380	82	0·09	16·37	16·46	24	40
1887* - - -	11,725	1,250	77	0·60	12·36	12·96	31	44
1888† - - -	14,147	1,341	77	2·83	12·72	15·55	28	43
1889 - - -	13,619	1,507	90	1·84	18·21	20·05	30	50

* Excluding troops on active service in Burma.
† Excluding troops in Upper Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases which caused increased admissions were venereal diseases (452 per 1,000 against 376), enteric fever (16 per 1,000 against 7), small-pox, ague, and simple continued fever. Among those from which admission was lessened were dysentery, alcoholism, diarrhœa, remittent fever, and respiratory diseases. Venereal diseases caused 30 per cent. of the total sickness, and ague 24 per cent.

The chief causes of death were enteric fever, heatstroke, cholera, hepatic abscess, remittent fever, and dysentery. Among the diseases which caused increased mortality were enteric fever (4·48 per 1,000 against 2·26), small-pox, heatstroke, dysentery, and hepatitis. Among those from which mortality was lessened were respiratory diseases, remittent fever, and cholera. Enteric fever caused about 22 per cent. of the total deaths.

The chief causes of invaliding were, in order, debility, syphilis, and gonorrhœa, dysentery, hepatic inflammation and abscess, injuries, malarial affections, rheumatism, tubercle of the lung, and diseases of the ear.

All the ratios shown in the following table for the European army of Bombay were higher than in the preceding year, and the daily sick ratio was unusually high, and higher than the corresponding ratio of the decennium, 1870–79 :—

European Army of Bombay.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Daily Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	103,587	1,533	57	1·53	13·74	15·27	43	58
1880	9,903	2,150	78	—	30·90	30·90	49	80
1881*	9,895	1,784	72	0·30	13·14	13·44	53†	67†
1882	11,085	1,405	61	0·63	9·74	10·37	36	46
1883	10,948	1,249	57	0·82	9·68	10·50	38	48
1884	10,725	1,455	65	4·85	14·54	19·39	31	51
1885	11,417	1,489	68	6·92	16·90	23·82	29	53
1886	11,050	1,490	73	0·36	12·31	12·67	28	41
1887	11,188	1,292	67	2·50	10·73	13·23	28	41
1888‡	11,882	1,372	67	0·59	11·11	11·70	25	37
1889	12,826	1,425	78	1·33	13·41	14·74	27	42

* Excluding troops in Afghanistan. † Including troops in Afghanistan.
‡ Excluding troops in Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases which caused increased admissions were venereal diseases (481 per 1,000 against 357), enteric fever (20 per 1,000 against 12), cholera, small-pox, and malarial fevers. Among those from which admission was lessened were simple continued and "other fevers," splenic affections, rheumatism, and eye diseases. Venereal diseases caused 34 per cent. of the total sickness, and ague 23 per cent.

The chief causes of death were enteric fever, cholera, heatstroke, and hepatic abscess. Among the diseases which caused increased mortality were enteric fever (5·93 per 1,000 against 4·04), cholera, respiratory diseases, and abscess of the liver. Among those from which mortality was lessened were circulatory diseases and diarrhœa. Enteric fever caused 40 per cent. of the total deaths.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial affections and tubercle of the lung, hepatic inflammation and abscess, palpitation, valvular disease of the heart, and mental disorders.

The vital statistics of the troops serving in the Quetta district are incorporated in those of the Bengal Presidency; but as the command is both important and comparatively new, they are discussed here separately. The admission and daily sick

ratios were very nearly the same as in 1888, while the death-rate was much lowered, notwithstanding the occurrence of cholera :—

Period.	Average Strength.	Ratio per 1,000.				
		Admissions.	Daily Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1884 - - -	1,441	2,056	82	27·07	41·63	68·70
1885 - - - -	1,672	2,187	94	42·46	40·67	83·13
1886 - - -	1,752	2,442	73	20·57	19·41	19·98
1887 - - - -	1,932	3,374	52	1·03	10·35	11·38
1888 - - -	2,223	1,140	59	—	13·50	13·50
1889 - - - -	2,210	1,152	58	0·90	9·05	9·95

The chief forms of sickness were ague, venereal diseases, injuries, respiratory diseases, simple continued fever, and diseases of the integuments. Among the diseases which caused increased admission were remittent and simple continued fevers, diarrhœa, and ague. Among those from which admission was lessened were hepatic inflammation and abscess (9 per 1,000 against 18), enteric fever (16 per 1,000 against 22), respiratory diseases (104 per 1,000 against 136), alcoholism, dysentery, "other fevers," &c. Ague caused 27 per cent. of the total sickness, venereal diseases 18 per cent., and respiratory diseases 9 per cent.

The chief cause of death was enteric fever. The ratio for enteric fever was 4·52 per 1,000 against 5·40 for the year preceding, and the ratio for respiratory diseases 0·45 against 2·70. Enteric fever caused 46 per cent. of the total mortality.

The vital statistics of the troops serving in Burma are included in those of the Madras Army; but, as the command is important and in great part new, they are reviewed separately here. The statistics of 1889 are complete for the whole year, those of 1888 for the last nine months only. The admission and daily sick rates were much higher, while the death-rate was considerably reduced. Though the death-rate from cholera was much reduced, the death-rate from other causes as a whole rose.

European Troops in Burma.

Year.	Average Strength.	Average Annual Ratio per 1,000.				
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1888* - - -	4,061	1,681	87	9·60	22·90	32·50
1889 - - - -	4,825	1,903	92	2·49	26·73	29·22

* Excluding men on active service the first three months of the year.

The chief forms of sickness were ague, venereal diseases, diseases of the integuments, injuries, dysentery, and diarrhœa. Among the diseases which caused increased admission were ague (806 per 1,000 against 478), enteric fever (4·4 per 1,000 against 2·5), hepatic, splenic, and pulmonary affections, scurvy, and rheumatism. Among those from which admission was lessened were cholera, dysentery, simple continued fever, remittent fever, and diarrhœa. Ague caused 42 per cent. of the total sickness, and venereal diseases 22 per cent.

The chief causes of death were remittent fever, heatstroke, cholera, hepatic abscess, enteric fever, dysentery, ague, and circulatory diseases. Among the diseases which caused increased mortality were enteric fever (2·28 per 1,000 against 0·98), ague, circulatory diseases, phthisis, and small-pox. Among those from which mortality was lessened were cholera, diarrhœa, respiratory diseases (0·41 per 1,000 against 1·48), and remittent fever. Remittent fever caused 13 per cent. of the total deaths.

The following two tables, again, for 1889, compare the health of the troops in Upper Burma with that of those in Lower Burma :—

European Troops in Upper Burma and Lower Burma for 1889.

	Average Strength.	Average Annual Ratio per 1,000.				
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
Upper Burma * - - -	2,110	2,181·0	104·3	—	29·86	29·86
Lower Burma * - -	2,215	1,287·1	76·7	·45	11·29	11·74

* Excluding expeditionary forces and troops marching.

Statement showing the diseases which have been the chief causes of mortality during 1889.

Causes of Death.	Died per 1,000 of Average Strength.								
	Cholera.	Enteric Fever.	Remittent Fever.	Dysentery.	Diarrhœa.	Abscess of Liver.	Pneumonia.	Phthisis Pulmonalis.	All Causes.
Upper Burma - -	—	2·37	3·79	1·90	·47	2·84	·47	·47	29·86
Lower Burma - -	·45	1·81	·90	·90	—	2·26	—	·90	11·74

As might have been expected, the troops in newly-acquired and unsettled Upper Burma were much more unhealthy than those in the older British possession. With the exception of cholera and phthisis, all the diseases in the second table caused a greater proportional mortality in Upper Burma than in Lower Burma.

Some of the more important causes of admission into hospital in the three Presidencies are shown in the following table in the direct order of their ratios :—

Admitted per 1,000 *of strength.*

Bengal.	1889.	1888.	1870 to 1879.	Madras.	1889.	1888.	1870 to 1879.	Bombay.	1889.	1888.	1870 to 1879.
Venereal diseases - -	491	373	209	Venereal diseases -	452	376	198	Venereal diseases -	481	357	191
Ague - - -	326	341	425	Ague - - -	364	233	140	Ague - - -	331	327	528
Simple continued fever -	59	82	*	Simple continued fever -	82	59	†	Simple continued fever -	65	92	‡
Respiratory diseases -	39	37	63	Dysentery - -	46	56	77	Diarrhœa - -	32	35	61
Diarrhœa - -	37	34	62	Diarrhœa - -	40	42	65	Rheumatism and neuralgia.	27	27	49
Rheumatism and neuralgia.	36	36	62	Rheumatism and neuralgia.	34	31	46	Respiratory diseases -	22	20	45
Dysentery - -	27	26	33	Hepatitis - -	33	33	67	Hepatitis - - -	21	20	41
Enteric fever - -	26	16	5	Respiratory diseases -	19	22	44	Dysentery - - -	21	21	28
Hepatitis - - -	23	24	47	Enteric fever - -	16	7	4	Enteric fever - -	20	12	3
Remittent fever - -	11	4	*	Remittent fever - -	8	11	†	Remittent fever - -	8	7	‡
Phthisis pulmonalis -	5	4	8	Other fevers - -	4	2	12	Other fevers - -	4	3	25
Spleen diseases - -	3	3	7	Phthisis pulmonalis -	3	4	9	Phthisis pulmonalis -	4	4	8
Other fevers - -	2	2	14	Spleen diseases - -	2	1	2	Spleen diseases - -	2	3	6
Total from all causes	1,517	1,398	1,522	Total from all causes	1,507	1,341	1,264	Total from all causes	1,425	1,372	1,533

* Fevers, remittent and simple continued = 182. † Fevers, remittent and simple continue l = 126.
‡ Fevers, remittent and simple continued = 131.

In all three Presidencies venereal diseases head the list, show higher ratios than in the previous year, and show much higher ratios than in the decennium. Ague comes next, but in the decennium its ratio was in the case of Bengal and Bombay much higher than that of venereal diseases. This is due to the increase of venereal disease in recent years. Bengal had the highest rates from venereal diseases, respiratory diseases, rheumatism and neuralgia, phthisis, spleen diseases, remittent fever, enteric fever, and all causes. Madras the highest from ague, simple continued fever, diarrhœa, dysentery, and hepatitis; while all the Bombay rates from the diseases in the table stood second or third.

Some of the more important causes of death in the three Presidencies are shown in the following table:—

Deaths from the Chief Diseases and from all Causes in the three Presidencies per 1,000 *of strength.*

Deaths from	Bengal.			Deaths from	Madras.			Deaths from	Bombay.		
	1889.	1888.	1870-79.		1889.	1888.	1870-79.		1889.	1888.	1870-79.
Enteric fever	6·68	4·15	2·28	Enteric fever	4·48	2·26	1·42	Enteric fever	5·93	4·04	1·75
Hepatic: Abscess	1·21	1·47	2·04	Cholera	1·84	2·83	1·68	Cholera	1·33	·59	1·55
Hepatic: Congestion and inflammation	·05			Hepatic: Abscess	1·47	2·05	3·16	Hepatic: Abscess	1·09	·84	1·71
Phthisis pulmonalis	·8	·77	1·20	Hepatic: Congestion and inflammation	·81			Hepatic: Congestion and inflammation	—		
Cholera	·84	2·10	4·18	Remittent fever	1·32	1·84	·62*	Dysentery	·78	·76	·98
Dysentery	·63	·51	1·37	Dysentery	1·40	1·06	2·32	Pneumonia	·55	·59	·70
Pneumonia	·49	1·03	1·25	Phthisis pulmonalis	·59	·42	1·18	Other respiratory diseases	·16		
Other respiratory diseases	·09			Pneumonia	·29	·64	·32	Remittent fever	·62	·34	1·14*
Remittent fever	·35	·16	1·74*	Other respiratory diseases	·07			Phthisis pulmonalis	·47	·42	1·09
Diarrhœa	·09	—	·12	Diarrhœa	·15	·21	·04	Diarrhœa	—	·17	·17
TOTAL FROM ALL CAUSES	16·07	15·47	21·00	TOTAL FROM ALL CAUSES	20·05	15·55	17·69	TOTAL FROM ALL CAUSES	14·74	11·70	15·27

* Including ague and simple continued fever.

In Bengal and Bombay enteric fever heads the list for all three periods; but in Madras cholera was higher than enteric fever in 1888, and hepatitis, dysentery, and cholera higher in the decennium. Bengal had the highest rates from enteric fever and phthisis. Madras the highest from hepatitis, cholera, dysentery, remittent fever, diarrhœa, and all causes. Bombay the highest from pneumonia and other respiratory diseases. The death-ratio from enteric fever increased in all three Presidencies. The percentage respectively of enteric fever, hepatitis, dysentery, and pneumonia in the total deaths of each Presidency was:—

1889.

	Bengal.	Madras.	Bombay.
Enteric fever	41·6	22·3	40·2
Hepatitis	7·9	11·3	7·4
Dysentery	3·9	7·0	5·3
Pneumonia	3·1	1·5	3·7

The Madras Presidency was, as usual, highest in dysentery and hepatitis, lowest in fever and pneumonia.

The following statement shows the admission and death-rates for a series of years in the several geographical groups of stations occupied by the European army of Bengal :—

Period.	Ratio per 1,000 of strength.															
	1 Bengal Proper.		2 Gangetic Provinces and Oudh.		3 Meerut and Rohilkhand.		4 Agra and Central India.		5 Punjab.		6 Quetta District.		7 Hill Stations.		Bengal Presidency.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1860-69	1,821	29·57	1,615	28·59	1,576	26·61	2,169	38·48	1,741	25·24	—	—	1,069	14·78	1,755	29·98
1870-79	1,311	14·43	1,410	20·06	1,461	18·31	1,536	18·41	1,847	20·71	—	—	1,044	12·23	1,522	21·00
1880*	1,469	16·03	1,494	29·32	2,011	22·98	1,935	15·07	2,126	36·41	—	—	1,253	20·75	1,813	27·73
1881*	1,610	12·02	1,741	15·94	1,867	17·81	1,728	10·11	1,949	23·44	—	—	1,177	9·97	1,729	17·05
1882	1,187	11·19	1,699	22·61	1,613	8·86	1,891	10·51	1,796	12·12	—	—	975	8·65	1,579	13·17
1883	1,011	9·10	1,474	17·04	1,528	10·56	1,497	14·27	1,601	9·47	—	—	1,454	6·33	1,463	11·21
1884	1,195	10·07	1,381	14·72	2,028	17·01	1,874	15·53	1,992	9·75	—	—	1,201	5·91	1,662	11·68
1885	1,449	13·09	1,539	15·23	2,463	18·00	1,687	10·93	1,566	12·67	—	—	1,395	9·50	1,661	13·16
1886	1,675	15·46	1,630	17·09	1,902	16·68	1,526	15·91	1,442	16·64	2,850	19·58	1,219	10·27	1,559	15·52
1887	1,617	14·17	1,437	19·01	1,750	14·31	1,696	20·03	1,375	13·63	1,374	11·38	1,112	12·42	1,426	14·83
1888	1,621	16·05	1,382	15·01	1,682	11·89	1,748	17·61	1,421	16·25	1,140	13·50	1,255	14·86	1,398	15·47
1889	1,465	13·29	1,524	17·32	1,653	18·73	1,869	21·72	1,678	18·51	1,152	9·95	1,172	9·76	1,517	16·07

* Excluding troops in Afghanistan and on the march.

The admission ratios of the second, third, fourth, and fifth groups were above the presidential ratios of the year. Comparing the group ratios of 1889 with the corresponding ratios of 1888, 1870–79, and 1860–69, it will be seen that those of Meerut and Rohilkhand and of the Hill Stations were the worst, and after them those of the Gangetic Provinces, and of Agra and Central India. Bengal Proper had the highest ratios from dysentery and from hepatitis; the Gangetic Provinces from phthisis; Meerut and Rohilkhand from enteric fever and venereal diseases; Agra and Central India from ague, remittent fever, and diarrhœa; the Punjab from simple continued fever; the Hill Stations from rheumatism and from spleen diseases; and the Quetta district from respiratory diseases.

The death ratios of the second, third, fourth, and fifth groups were above the presidential ratios of the year. Comparing the group ratios of 1889 with the corresponding ratios of 1888, 1870–79, and 1860–69, it will be seen that those of Meerut and Rohilkhand and of Agra and Central India were the worst. The ratios of all the groups were lower than the corresponding rates of 1860–69. Bengal Proper had the highest rates from cholera and abscess of the liver; the Gangetic Provinces from diarrhœa; Meerut and Rohilkhand from enteric fever and phthisis; Agra and Central India from remittent fever, dysentery, and all causes; and the Punjab from pneumonia.

Bengal stations.

Of the large garrisons, with a strength of over 1,000, the following returned death-rates higher than that of the presidency for the year (16·07):—Bareilly 32·79, Agra 21·60, Ferozepore 21·93, Sialkot 17·54, Meean Meer 47·49, Rawal Pindi 16·72, Peshawar 20·80

The following statement shows the admission and death-rates in the several geographical groups occupied by the European armies of Madras and Bombay:—

Period.	Ratio per 1,000 strength.													
	1 Rajputana, Malwa, Sind, and Aden.		2 Deccan and Nagpur.		3 Southern India.		4 Burma.		5 Hill Stations and Hill Convalescent Depôts.		Bombay Presidency.		Madras Presidency.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1870-79	1,614	17·41	1,383	14·14	1,235	13·70	1,092	17·32	1,594	15·16	1,533	15·27	1,264	17·69
1888	1,468	13·34	1,232	9·19	1,323	9·00	1,681	32·50	1,224	4·10	1,372	11·70	1,341	15·55
1889	1,577	20·47	1,286	14·20	1,361	10·17	1,903	29·22	1,304	5·83	1,425	14·74	1,507	20·05

The admission ratios of the first and fourth groups were above the presidential ratios of the year. Comparing the group ratios of 1889 with the corresponding ratios of 1888 and of 1870–79, it will be seen that those of Southern India and of Burma were the worst. The first group had the highest ratios from enteric fever, and the second highest from respiratory diseases; the Deccan and Nagpur the highest from venereal diseases; Southern India the highest from simple continued fever; Burma the highest from ague, remittent fever, dysentery, diarrhœa, hepatitis, spleen diseases, rheumatism, and all causes; and the Hill Stations the highest from respiratory diseases.

The death ratios of the first and fourth groups were above the presidential ratios of the year. Comparing the group ratios of 1889 with the corresponding ratios of 1888 and of 1870–79, it will be seen that those of the first and second groups were the worst. The first group had the highest rates from enteric fever and from pneumonia; Burma the highest from cholera, remittent fever, dysentery, diarrhœa, abscess of the liver, and all causes; and the Hill Stations from phthisis.

Of the large garrisons, with a strength of over 1,000, the following returned death-rates higher than those of the Presidencies (Madras 20·05, Bombay 14·74), Mhow 26·84, Secunderabad 30·45.

Cholera.

The amount of cholera in the European Army was much less than in the previous year. There were only 103 admissions against 207, and 78 deaths against 137. The permillage of admissions to strength was 1·5, and of deaths 1·13, and the percentage of deaths to cases 75·00. The corresponding figures of 1888 were 3·0, 1·99, and 63·77; and of the decennium 1870–79, 4·7, 3·22, and 69·11. About 69 per cent. of the whole number of cases occurred in the months of July, August, and September, the maximum being in July.

The ratios of morbidity, mortality, and fatality in the Bengal Army were respectively 1·1, 0·84, and 75·00, against 3·5, 2·10 and 60·81 in 1888, and against 5·9, 4·18, and 70·26 in the decennium 1870–79. Of the total 47 cases, 16 occurred in March and April, and 26 in July, August, and September, the maximum being in September. The station most severely visited was Meean Meer, where there were 14 cases with 13 deaths in September.

The morbidity and mortality ratios of Madras (2·2 and 1·84), though still somewhat high, were considerably reduced. On the other hand, the fatality ratio was 83·33 against 71·43 in 1888, and 58·49 in 1870–79. Of the total of 30 cases, 26 occurred in July, August, and September, the maximum being in July. Secunderabad had 16 cases with 12 deaths in July and August, and there were 8 cases with 7 deaths among the troops marching to the Chin Expedition

The morbidity ratio of the Bombay army rose from 0·8 to 2·0, and the mortality ratio from 0·59 to 1·33; while the fatality ratio was only 65·38 against 70·00 in 1888, and 73·27 in 1870–79. The whole of the 26 cases occurred from May to September inclusive, the maximum being in July. Neemuch had 15 cases in May, June, July, with 9 deaths, 10 of the cases being in July.

Bengal cholera mortality was greatest in Bengal Proper (2·14) and in Agra and Central India (2·0), least in the Hill Stations (0·15) and in Meerut and Rohilkhand (8·90). The mortality in Bengal Proper was less than in 1888, greater than in 1870–79, less than in 1860–69. The mortality in Agra and Central India (1·45) rose from the zero of 1888, but was less than in 1870–79 and 1860–69. The mortality of the Hill Stations (0·15) was less than in 1888 and the two decennia. The mortality of Meerut and Rohilkhand (0·22) was greater than in 1888, but less than in the decennia. In the other armies cholera-mortality was highest in Burma (2·49), and lowest in Southern India (0·25). The mortality of Burma was less than in the decennium, and much less than in 1888. That of Southern India was greater than in 1888, but less than in the decennium.

Small-pox.

Small-pox was more prevalent. There were 153 admissions (2·2 per 1,000) and 17 deaths (0·25 per 1,000) against 111 (1·6 per 1,000) and 10 (0·15 per 1,000) in 1888. The increase was entirely in Madras and Bombay. Lucknow had 26 cases with 1 death, Poona 11 with none, Secunderabad 11 with 1, Bangalore 10 with 1, Kamptee 10 with none, Peshawar 9 with 3.

Fevers.

Ague gave rise to about 22 per cent. of the admissions from all causes in the army of India. The admission-rate (334) was 18 per 1,000 higher than in the previous year. In Bengal there was lowering of both the admission and death-rates; in Madras both were considerably raised; while in Bombay, though there was an increased prevalence

of ague, there was no mortality, nearly all the fatal fevers being returned either as remittent or as enteric. By far the most malarious group was Burma, followed by Agra and Central India and the Punjab; whilst the least malarious was the Bengal Hill Stations, followed by the Deccan and Nagpur and the Gangetic Provinces.

The admission and death ratios from remittent fever rose respectively from 6·1 and 0·54 to 10·0 and 0·59. The increase was in Bengal and Bombay, especially the former. In Bengal the group which had the highest admission ratio was Agra and Central India (46·6 against the 7·0 of 1888); Burmah was the group that suffered most in the Madras army.

For India the admission ratio from simple continued fever (64·7) was considerably diminished, while the death ratio (0·03) remained unchanged. No deaths were returned under this head from the Bengal army. Only the Madras army recorded an increased prevalence of simple continued fever.

The beginning has been made of an important advance in the investigation of the pathology of the enteric fever of India. Through the kindness of Brigade-Surgeon Hamilton, Surgeon-Major Knox, and Surgeon McGill, specimens of spleen and mesenteric glands from two cases were forwarded to a distinguished bacteriologist, Professor Bernhard Fischer, of Kiel, Germany, who reports that he found the *bacillus typhosus* in all the specimens. As the chief bacteriologists of Europe agree that the bacillus occurs in all* cases of enteric fever, and never in other diseases, the conclusion is now absolutely certain that at least some of the fatal fevers of India with intestinal lesions are identical with the enteric fever of Europe. For the solution of the question whether the same holds good of all or most of such Indian fevers a skilled bacteriological examination of many cases will be required; and it is to be hoped that progress in this research may be rapid, now that a beginning has been made.† In the meanwhile, for practical working purposes, the safest presumption will be that where a *competent* observer finds naked-eye anatomical lesions to all appearance characteristic of enteric fever, there the bacillus probably is also.

The constant association of the bacillus with the disease makes it all but certain, in the opinion of the most able bacteriologists of Europe, that the bacillus is there the cause of the disease. If this be so in Europe, it must be so also in India. Hence the source of *real* enteric fever in India must be looked for in the contamination of ingesta, and climate must be considered but a secondary influence.

As compared with the corresponding ratios of 1888 the admission (22·9), and death ratios (6·11) for enteric fever increased respectively by over 9 and over 2 per 1,000.

The following table shows the admission- and death-rates for enteric and for intermittent, remittent, and simple continued fevers for a series of years:—

Period.	Bengal.						Madras.						Bombay.					
	Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.		
	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.
1870-79*	5·3	607·3	612·6	2·28	1·74	4·02	3·9	266·5	270·4	1·42	0·62	2·04	3·1	659·9	663·0	1·75	1·14	2·89
1880†	8·7	809·6	818·3	3·07	2·66	5·73	2·6	450·1	452·7	1·36	0·39	1·75	9·5	1,117·3	1,126·8	5·76	3·23	8·99
1881†	6·3	763 9	770·2	2·62	0·81	3·43	0·9	278·7	279·6	0·58	0·19	0·77	4·2	840·6	844·8	2·83	0·91	3·74
1882	7·3	600·0	667·3	2·90	0·77	3·67	4·0	171·5	175·5	2·09	0·27	2·36	5·1	558·5	563·6	1·90	0·81	2·71
1883	8·1	486·4	494·5	2·52	0·44	2·96	8·6	128·4	137·0	2·86	0·28	3·14	5·7	436·4	442·1	1·55	0·73	2·28
1884	12·6	682·8	695·4	3·31	0·36	3·67	11·4	166·0	177·4	1·67	—	1·67	9·1	504·4	513·5	2·05	2·14	4·19
1885	14·0	611·0	625·0	4·05	0·60	4·65	6·4	149·4	155·8	2·19	0·19	2·38	7·3	577·5	584·8	2·54	1·49	4·03
1886	21·6	490·5	512·1	5·70	0·99	6·69	11·9	259·8	271·7	3·85	0·89	4·74	12·3	472·2	484·5	4·16	0·27	4·43
1887	13·4	449·7	463·1	4·09	0·76	4·85	11·5	203·6	215·1	2·98	0·51	3·49	11·3	372·6	383·9	3·40	0·90	4·30
1888	16·2	427·1	443·3	4·15	0·34	4·49	7·4	302·8	310·2	2·26	2·19	4·45	11·6	425·5	437·1	4·04	0·34	4·38
1889	25·8	396·4	422·2	6·68	0·47	7·15	16·2	453·9	470·1	4·48	1·98	6·46	20·3	404·1	424·4	5·93	0·70	6·63

* Including troops on active service and on the march. † Excluding troops in Afghanistan.

* In a small percentage of cases it is not found. This is probably partly due to the technical difficulties of the search for it, and partly to the bacillus not always lasting as long as the sickness originated by it.

† In the beginning of the year Surgeon-Major Ranking isolated from the *albuminous* urine of a patient convalescing from "enteric" fever a bacillus, which, cultivated on glycerine-agar and on potato, showed the characteristics of the *bacillus typhosus*.

With regard to both admissions and deaths from enteric fever, Bengal stood highest, Madras lowest. In both admissions and deaths the ratios of all three Presidencies were higher than the corresponding ratios of the preceding year, and of the decennium 1870–79. The table also shows, especially for admissions, the gradual increase in the diagnosis of enteric fever during the last ten years, and the corresponding gradual diminution in the number of other fevers diagnosed per thousand. The great increase of non-enteric fevers in the Madras army during the last four years is due to the new territory of Upper Burma having been placed under that Command. The following table also compares enteric fever with the same other fevers, but in respect of mortality only :—

	During 1870–79.			During 1880–89.			During 1888.			During 1889.		
	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both
Army of India†	2·03	1·42	3·45	3·67	0·92	4·59	3·75	0·73	4·48	6·11	0·81	6·92
„ Bengal‡	2·28	1·74	4·02	4·05	0·91	4·96	4·15	0·34	4·49	6·68	0·47	7·15
„ Madras†	1·42	0·62	2·04	2·50	0·77	3·27	2·26	2·19	4·45	4·48	1·98	6·46
„ Bombay‡	1·75	1·14	2·89	3·45	1·12	4·57	4·04	0·34	4·38	5·93	0·70	6·63

* Intermittent, remittent, and simple continued fevers.
† Excluding troops on active service in Burmah during 1885 to 1887.
‡ Excluding troops in Afghanistan during 1881.

It shows that in the last 10 years, and especially of recent years, there has been an increase in total fever mortality, usually ascribed to the greater youthfulness and recent arrival of the soldiers of to-day; and an increase of mortality from enteric fever accompanied by a decrease in mortality from the other fevers, which is probably partly due to increased susceptibility on the part of the army, from youth and recent arrival, and partly due to the greater frequency with which the diagnosis of enteric fever is now made.

In the following table the groups are arranged in the direct order of their admission-rates from enteric fever :—

	Average strength.	Number of Cases.	Admissions per 1,000.	Number of Deaths.	Deaths per 1,000.	Percentage of Deaths to Cases.	Percentage of Deaths to Cases in 1870–79.
1. Meerut and Rohilkhand	4,646	157	33·8	46	9·90	26·44	42·63
2. Gangetic Provinces	7,273	230	31·6	45	6·74	18·49	41·15
3. Punjab	13,395	374	27·9	106	7·91	27·32	48·51
4. Agra and Central India	3,453	93	26·9	31	8·98	32·29	46·37
5. Hill Stations	6,453	140	21·7	29	4·49	20·71	35·07
6. Quetta District	2,210	36	16·3	10	4·52	22·22	*
7. Convalescent Depôts	1,776	26	14·6	8	4·50	30·77	*
8. Bengal Proper	2,332	33	14·2	4	1·72	11·43	38·46
Bengal Presidency	42,821	1,103	25·8	286	6·68	24·18	43·39
1. Rajputana, Malwa, Sind, and Aden.	5,814	194	33·4	55	9·46	27·09	60·65
2. Deccan and Nagpur	9,506	222	23·4	60	6·31	46·15	43·19
3. Hill Stations and Hill Convalescent Depôts.	1,201	12	10·0	3	2·50	23·08	50·00
4. Southern India	3,935	26	6·6	5	1·27	16·67	31·22
5. Burma	4,825	21	4·4	11	2·28	44·00	34·29
Madras Presidency	13,619	221	16·2	61	4·48	26·18	36·43
Bombay Presidency	12,826	260	20·3	76	5·93	27·74	56·39
Army of India	69,266	1,584	22·9	423	6·11	25·03	43·83

* Not available.

In Bengal the group Meerut and Rohilkhand has mounted up to the first place; and though the Gangetic Provinces retain, as usual, a high place, the Hill Stations are

lower down than has of recent years been their wont. As compared with the corresponding ratios of 1888, the admission- and death-rates of only Quetta, the Hills, and Southern India were diminished. Both ratios of all the other groups were not only increased, but for the most very much increased. The maximum death-rate was 9·90 in Meerut and Rohilkhand, and the minimum 1·27 in Southern India. The highest percentage of fatality was 46 in the Deccan, and the lowest 11 in Bengal Proper. With few exceptions the fatalities were lower than in the decennium, this being due apparently to the greater number of non-fatal cases now-a-days diagnosed as enteric fever.

The following shows those garrisons of India which had an average strength of over 1,000, arranged in the direct order of their admission ratios from enteric fever:—

ENTERIC FEVER in 1889.

Stations over 1,000 *strong.*

Stations.	Average Annual Strength.	Admission-rate per 1,000 of Strength.	Death-rate per 1,000 of Strength.	Died out of each 100 Cases treated.
Bareilly	1,220	77·9	23·77	27·10
Mhow	1,565	75·4	17·89	23·73
Secunderabad	2,594	62·5	16·19	25·45
Sialkot	1,254	58·2	10·37	16·88
Lucknow	2,912	38·1	5·49	12·03
Ferozepore	1,140	32·5	9·65	29·73
Rawal Pindi	2,692	27·1	7·80	26·58
Meean Meer	1,074	25·1	13·97	53·57
Peshawar	1,635	25·1	9·79	39·02
Agra	1,111	18·9	9·00	47·62
Umballa	1,999	18·5	1·00	5·00
Quetta	2,208	16·3	4·53	22·22
Meerut	1,923	16·1	4·16	22·22
Bangalore	1,928	11·9	2·59	18·52
Murree Hills	1,715	11·7	2·33	20·00
Poona	2,159	10·2	2·32	20·83
Belgaum	1,138	1·8	·88	50·00
Fort William	1,119	·9	—	—

The highest admission and death ratios were those of Bareilly and of Mhow; Mhow relapsing from a great temporary improvement in the previous year, and Bareilly increasing its already high ratios by 51·1 in morbidity, 19·43 in mortality, and 10·88 in fatality. The lowest rates in the list are those of Fort William and Belgaum. The fatality percentage varied between 53·57 at Meean Meer and 5·00 at Umballa.

Owing to a change in the army forms the tables here given in former years cannot be continued. Accordingly a new series begins with 1889:—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Ages, together with Ratios of Liability to it, for 1889.

Year.	Mortality from Enteric Fever and Ratio of Liability to it at Different Ages.					
	24 and under.		25 to 29.		30 to 34.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	9·81	64·50	3·25	21·37	1·83	12;03

The above shows the greater liability of the young soldier to die from enteric fever, and the decreasing liability with advancing age.

The following statement shows that the recent arrival is more apt to die from enteric fever than he who has been longer in the country, and that with increased service in India the liability to death from enteric fever rapidly diminishes:—

Statement showing the Death Ratio of the European Army from Enteric Fever at different Periods of Residence in India, together with Ratios of Liability to it, for 1889.

Year.	Mortality from Enteric Fever, and Ratio of Liability to it at Different Periods of Residence in India.					
	1st and 2nd Years.		3rd to 5th Year.		6th to 10th Year.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889 - - - - - - -	11·65	57·02	4·20	20·56	2·43	11·89

As in former years, medical officers were usually unable, even to their own satisfaction, to trace out in any given outbreak a definite insanitary condition to which the outbreak might with certainty be attributed. Most medical officers lay stress on the influence of climate acting on young and unseasoned soldiers; and many notice that increase of the disease in a station is due to the arrival of fresh drafts from the old country. Many medical officers suspect strongly the bazaar supplies, especially the bazaar drinks, obtained privately by the men; and also impure water drunk casually by soldiers on the march. In several cases diagnosed as enteric exposure to the sun is mentioned as a cause. The water supply in South Bangalore is said to be "not above suspicion," and the milk in Lucknow and some other stations was suspected. At Jutogh the disease was attributed to the emanations from a filthy open drain near the barrack, and at Sailkot to sub-soil pollution from bad conservancy, while at Jhansi the only suggested cause was overcrowding of the station. As a rule cases seemed to come from the various barracks of a station without preference, and connecting links between the cases could not be discovered. But in one case at Roorkee and in three cases at Chakrata the men affected were hospital orderlies in charge of enteric patients, and were suspected by the medical officers of having got the disease from the sick through the medium of their excretions; and the medical officer of Roorkee considers it would be safer in future to choose orderlies for such cases from among men who have already had the disease. Lastly, in the case of many admissions, especially in the Hill Stations, it is noted that the disease must have been contracted before arrival.

Besides the more common difficulties of diagnosis there occurred some cases in which the doubt was between enteric fever and abscess of the liver. In two cases, at Jutogh and Karachi, the intestinal lesions were unusually extensive, beginning at the pylorus or in the duodenum. On the other hand, in two cases at Campbellpore and Fort Lahore the spleen was found healthy or small; and in cases at Chunar, Campbellpore, and Subathu no intestinal lesions were found.

The admission rate from dysentery in the army of India was slightly reduced (30 per 1,000 against 31), that from diarrhœa remained the same (36 per 1,000), the mortality from each being at the same time somewhat increased (0·81 against 0·67 per 1,000 and 0·09 against 0·07 respectively).

Dysentery was most prevalent in the Madras army, least so in the Bombay army. In Bengal the admission ratio (27 per 1,000) was higher than in 1888 or 1887, but lower than in the two decennia; in Madras (46 per 1,000) it was lower than in all the same; in Bombay it was 21 per 1,000 as in 1888, but lower than in 1887 and the decennia. Mortality from dysentery was highest in the Madras (1·40), lowest in the Bengal army (0·63). In Bengal the mortality was higher than in 1888 or 1887, but lower than in the two decennia; in Madras it was higher than in 1888 or 1887, but lower than in 1870–79; in Bombay (0·78) it was higher than in 1888, but lower than in 1887 and the decennium.

Diarrhœa was most prevalent in the Madras, least so in the Bombay army. In Bengal the admission-rate (37 per 1,000) was higher than in 1888, lower than in 1887, and the two decennia; in Madras (40 per 1,000) it was lower than in 1888 and the decennium 1870–79; in Bombay (32 per 1,000) it was lower than in 1888, 1887, and the decennium. Mortality was highest in Madras (0·15), and was altogether wanting

in Bombay. In Bengal (0·09) it was higher than in 1888 and 1887, and lower than in the two decennia; in Madras it was lower than in 1888, but higher than in 1887 and 1870–79; in Bombay it was lower than in 1888, 1887, and the decennium. It was in Burma that the greatest sickness and mortality of the Madras army from bowel complaints took place.

Hepatitis.

There was during the year under review a decrease both in the sickness and in the mortality due to hepatitis. This is satisfactory, because there had been a tendency to rise, as noted in last report. In the army as a whole the admission-rate was in the ratio of 24 per 1,000 of average strength, and the death-rate 1·43. The ratios of Madras (33 and 2·28) were, as usual, higher than those of the other presidencies. The ratios of Bengal were 23 and 1·26. Those of Bombay were the lowest (21 and 1·09). In all cases the ratios were below those of the decennia.

The percentage of hepatic abscess in the total causes of death was much alike in the three presidencies, that in Bengal being the highest (7·6). The mortality per 1,000 of strength from abscess of the liver was highest in Madras (1·47), lowest in Bombay (1·09). Bengal Proper had a mortality of 2·57 from hepatic abscess, and 19 per cent. of all its deaths were from that disease; Burma had a mortality of 2·49 from hepatic abscess, and 8·5 per cent. of all its deaths were from the same.

Respiratory diseases.

Though there was an increase of 1 per 1,000 in the prevalence of respiratory diseases, yet the ratio (32 per 1,000) was comparatively favourable, and the death-rate (0·56) was considerably reduced. Bengal had the highest admission ratio (39 per 1,000), Madras the lowest (19 per 1,000). The ratios of Bengal and Bombay were increased, that of Madras diminished. They were all much below the decennial ratios. The mortality of Bombay only was increased; but the mortalities of both Madras (0·36) and Bombay (0·71) were above the decennial average. The greatest prevalence of respiratory diseases was in the Quetta district (104 per 1,000), and in the Punjab (48 per 1,000).

Venereal disease.

Venereal disease caused *directly* 32·1 per cent. of the admissions, 0·7 per cent. of the deaths, and 8·4 per cent. of the invaliding of the army of India. The admission-rate rose about 110 per 1,000 above that of 1888. All three presidencies participated in the rise.

Admissions from Venereal Diseases in the three Presidencies.

Presidency.	Admissions per 1,000.										
	1870–79.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Bengal	209	276*	276*	271	281	291	363	394	356	373	491
Madras	198	275	258	288	289	307	350	394	400	376	452
Bombay	191	269	261*	224	218	292	272	370	337	357	481
India	203	250	260	265	270	294	343	389	361	371	481

* Excluding troops in Afghanistan.

In the year 1884 the Contagious Diseases Acts were still in force, and the following table compares the venereal statistics of 1884, 1888, and 1889:—

ARMY OF INDIA.

Venereal Admissions of 1884, 1888, *and* 1889 *compared.*

Venereal Diseases.	1889. Strength 69,266.			1888.* Strength 68,549.			1884.* Strength 55,349.		
	Admissions into Hospital.	Ratio per 1,000.		Admissions into Hospital.	Ratio per 1,000.		Admissions into Hospital.	Ratio per 1,000.	
Primary syphilis	9,299	134·3	225·1	4,941	72·1	142·1	4,892		88·4
Ulcer of penis	6,293	90·9		4,798	70·0				
Secondary syphilis	3,549		51·2	2,218		32·4	1,352		24·4
Gonorrhœa	12,334	178·1	205·2	12,318	179·7	197·7	8,070	145·8	179·0
Other venereal diseases	1,878	27·1		1,237	18·0		1,835	33·2	
Total	33,353		481·5	25,512		372·2	16,149		291·8

* From Annual Returns.

Regarding only the ratios to the right of the brackets, it appears that all the ratios of 1888 were greater than those of 1884, and all those of 1889 greater than those of 1888.

In the army of Bengal venereal disease caused *directly* 32·4 per cent. of the admissions, 0·6 per cent. of the deaths, and 6·3 per cent. of the invaliding. The admission-rate rose about 118 per 1,000 over that of 1888. To compare the years 1866, before the Contagious Diseases Acts were imposed, 1884, while they were in force, and 1889, after they were abrogated, the following table shows the venereal disease of Bengal station by station.

In the army of Madras venereal disease caused *directly* 30 per cent. of the admissions, 1·1 per cent. of the deaths, and 12·6 per cent. of the invaliding. The admission-rate rose about 76 per 1,000 over that of 1888.

In the army of Bombay venereal disease caused *directly* 33·8 per cent. of the admissions, 0·5 per cent. of the deaths, and 9·8 per cent. of the invaliding. The admission ratio rose about 124 per 1,000 above that of 1888.

Invaliding.

In the whole army of India 1,789 men were invalided, or 25·92 per 1,000 of average strength, against 1,557 and 22·71 in the preceding year. The ratio for 1889 was about 17 per 1,000 less than that of the decennium 1870–79, which was 43·04. The proportion of invalids to strength was, as usual, lowest in Bengal. It was highest in Madras.

Thirty-seven per cent. of the total number invalided were discharged as unfit for further service. This proportion, as may be seen from the following table, was not out of the common. Only in Madras was the proportion of discharge greater than in the previous year; and it was higher in that Presidency than in the others.

Percentage of those invalided for discharge to total number invalided.

——	1885.	1886.	1887.	1888.	1889.
Army of India -	40	41	37	39	37
„ Bengal -	43	46	41	40	37
„ Madras -	47	42	43	43	46
„ Bombay -	29	28	22	29	25

The following table shows the diseases which caused invaliding of not less than 1 per 1,000 of strength :—

Bengal.		Madras.		Bombay.	
Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.
Debility - - -	3·64	Debility - - -	4·57	Debility - - -	4·50
Palpitation of heart - -	1·67	Venereal diseases - -	3·46	Venereal diseases - -	2·33
Valve disease of heart -	1·60	Dysentery - - -	2·43	Malarial fevers - -	1·78
Mental diseases - -	1·39	Hepatitis and congestion of liver - - -	1·84	Tubercle of lung - -	1·78
Tubercle of lung - -	1·32	Injuries - - -	1·18	Palpitation of heart - -	1·47
Venereal diseases - -	1·32	Malarial fevers - -	1·03	Valve disease of heart -	1·24
Malarial fevers - -	1·29	Tubercle of lung - -	1·03	Hepatitis and congestion of liver - - -	1·09
Injuries - - -	1·15	Rheumatism - -	1·03	Mental diseases - -	1·01
Hepatitis and congestion of liver - - -	1·01	Diseases of the ear - -	1·03		

Debility stood first as a cause of invaliding in all three Presidencies. The high place taken by heart diseases in Bengal, by venereal diseases and dysentery in Madras, and by venereal diseases in Bombay is noticeable.

There was a decrease in the ratio of invaliding from mental disease in the army of India from 1·37 per 1,000 in 1888 to 1·23 in 1889. The ratios of Madras (0·96), and Bombay (1·01), were also diminished, but that of Bengal was increased (1·39 against 1·25). There were 38 cases of melancholia, 22 of dementia, and 18 of mania.

As regards the relation of invaliding to age, the percentage of men who were invalided while under 25 years of age to the whole number invalided was 50·06 for the army of India against 46·58 in the previous year. The percentage of men under 25 in the strength of the army was 49 against 50 in the preceding year.

Of the total number of men invalided 29 per cent. were of less than two years' service, and 82 per cent. were of less than five years' service. With this is to be considered the fact that 78 per cent. of all the men in the strength of the army in 1889 were of less than five years' service.

The percentage to total invaliding of invaliding in the first four years of Indian service was 48 in the period 1871–75, 68 in the period 1881–85, and 69 in 1889; while the percentage of men invalided in the first four years of service who were under 30 years of age has risen from 73 in 1871–75 to 94 in 1889. Of the men invalided under four years of Indian service in 1889, 65 per cent. were also under 25 years of age.

Statistics of women and children.

The admission-rate among women (766·0 per 1,000), was lower than in any year since 1885. The chief causes of admission were fevers, debility, and diseases peculiar to women. The chief diseases which caused increased admission were small-pox, enteric fever, dysentery, and debility; while there was a diminution in malarial fevers, and in most of the other principal diseases. In the Bengal Presidency, the admission-rate was 669·4, in Madras 976·8, and in Bombay 755·1; the first showing a great decrease as compared with the previous year, the others an increase. Comparing the three Presidencies with reference to the incidence of certain diseases, Madras had the highest ratio for debility and respiratory diseases, Bombay the highest for cholera, enteric fever, ague, and bowel complaints.

The mortality among women (20·21), was lower than in the previous year, but higher than in any other year since 1883. The chief causes of death were, in order, puerperal affections, enteric fever, cholera, and remittent fever. The chief increase of death was in fevers, and the chief decrease in circulatory diseases, respiratory diseases, and cholera. In the Bengal Presidency the death ratio was 19·24, in Madras 22·00, and in Bombay 20·54; Madras being the only Presidency which had a higher death-rate than in the previous year. Comparing the three Presidencies with regard to mortality from certain diseases, Bengal had the highest ratio for respiratory diseases, phthisis, and puerperal affections; Bombay the highest for cholera, enteric fever, remittent fever, and bowel complaints. Bengal had no deaths from enteric fever; Madras none from cholera, bowel complaints, respiratory affections, and phthisis; and Bombay none from respiratory diseases, phthisis, and puerperal affections. In Bengal the chief increase was in puerperal affections, and the chief decrease in cholera; in Madras the chief increase in enteric fever, and the chief decrease in phthisis; in Bombay the chief increase in enteric and remittent fevers, and the chief decrease in puerperal affections.

The admission-rate among children (485·7), was lower than in any of the previous nine years. The chief causes of admission were, in order, respiratory diseases, ague, diarrhœa, simple continued fever, debility, eye diseases, and teething. The greatest increase of admission was in enteric fever, and the greatest decrease in measles. There was increase also in remittent fever, "other fevers," dysentery, and tuberculous affections; and decrease also in cholera, small-pox, whooping-cough, diphtheria and croup, ague, simple continued fever, diarrhœa, respiratory diseases, eye diseases, debility, teething, and convulsions. In the Bengal Presidency the admission-rate was 352·6, in Madras 786·9, and in Bombay 459·1; the last being the only Presidency which had a higher ratio than in the previous year.

The mortality among children (48·01), was lower than it had been for two years. The chief causes of death were, in order, convulsions, diarrhœa, teething, respiratory diseases, and debility. The greatest increase of mortality was in enteric fever and ague, and the greatest decrease in measles. There was decrease also in cholera, croup, respiratory diseases, debility, and convulsions. In the Bengal Presidency the death ratio was 40·22, in Madras 56·62, and in Bombay 58·93; Bengal being the only Presidency which had a lower death-rate than in the previous year.

Native Troops.

Sickness and mortality in 1889.

The health of the Native army of India, though not so good as in the previous year, was on the whole satisfactory. In the admission, daily sick, and death-rates the rise, as compared with the preceding year, was but slight, while the cholera mortality was reduced.

Sickness and Mortality during the period 1877-81 *and the years* 1880-89.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	All Causes.	
1877–81 -	118,669	1,422	48	1·94	24·90	27·40
1880 - -	126,385	1,545	56	0·53	39·22	41·12
1881 - -	114,612	1,305	46	0·97	19·24	22·62
1882 - -	114,894	1,129	37	1·02	12·24	14·76
1883 - -	114,830	923	31	1·15	11·76	14·31
1884 - -	114,827	1,042	33	0·71	10·50	12·22
1885* - -	115,486	978	32	1·61	13·67	16·09
1886* - -	106,010	973	31	1·27	13·27	19·46
1887* - -	105,254	1,045	33	1·31	11·68	18·17
1888† - -	124,822	995	33	2·14	12·84	16·14‡
1889 - -	128,642	1,003	35	0·68	12·94	16·19

* Excluding men on active service in Burma.
† Including Upper Burma for the last nine months of the year.
‡ Including deaths in Upper Burma in the first three months of the year.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases which caused increased admission were small-pox, enteric fever, ague, remittent fever, spleen diseases, dysentery, respiratory diseases, and venereal diseases. Among those from which admission was lessened were cholera, simple continued fever, diarrhœa, scurvy, rheumatism, and guinea-worm. Ague caused 46 per cent. of the total admissions. The chief causes of death were pneumonia and malarial fevers. Among the diseases which caused increased mortality were malarial fevers, bowel complaints, and respiratory diseases. Among those from which mortality was lessened were cholera and phthisis. Pneumonia caused 20 per cent. and remittent fever 11 per cent. of the total deaths. The chief causes of invaliding in the Native army were anæmia and debility, rheumatism, respiratory diseases, and eye diseases.

If the statistics for Native troops be compared with those for European troops, it will be seen how much less the Native soldier suffers from enteric and simple continued fevers, hepatic affections, and venereal diseases, and how much more he suffers from ague, dysentery, and pneumonia, than his European comrade.

Army of Bengal.

The statistics of the Native army of Bengal for the year under review compare not unfavourably with the past. As compared with 1888, the admission and daily sick-rates were raised, while the death rates were reduced.

Sickness and Mortality during the ten-year period, 1867 *to* 1876, *and of the years* 1880 *to* 1889 *compared.*

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	All Causes.	
1867–76 - - - -	39,508	1,360	42	2·12	13·84	17·25
1880* - - - -	30,365	1,609	65	1·52	33·85	53·15†
1881* - - - -	36,896	1,495	51	0·92	19·76	27·73†
1882 - - - -	40,256	1,250	41	0·72	13·34	16·49
1883 - - - -	40,932	985	32	0·56	10·55	13·98
1884 - - - -	40,850	1,193	35	0·71	10·97	12·56
1885‡ - - - -	40,753	1,076	34	0·29	10·11	14·18
1886§ - - - -	40,547	1,065	34	1·87	14·45	22·29
1887§ } (a) - - - -	54,547	1,195	36	1·52	12·47	18·94
1888‖ } (a) - - - -	63,312	1,066	33	1·83	13·60	16·93¶
1889 - - - -	65,360	1,116	37	0·38	12·96	16·30

* Excluding troops in Afghanistan.
† These ratios are calculated on the total regimental strength, including the army in Afghanistan.
‡ Excluding men on active service in Burma and Egypt.
§ Excluding men on active service in Burma.
‖ Excluding men on active service in Burma for the first three months, and in Hazara for October and November.
¶ Including deaths in Upper Burma in the first three months of the year.
(a) Includes the Punjab Frontier Force, not included in the reports for 1887 and 1888.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases which caused increased admission were ague, remittent fever, spleen affections, dysentery, scurvy, respiratory, diseases, venereal diseases, and guinea-worm. Among those from which admission was lessened were cholera, diarrhœa, "other fevers," and rheumatism. Ague caused over 50 per cent. of the total admissions. The chief causes of death were pneumonia and malarial fevers. Among the diseases which caused increased mortality were ague, hepatic affections, respiratory diseases, and scurvy. Among those from which mortality was lessened were cholera, enteric fever, remittent fever, and bowel complaints. Pneumonia caused 26 per cent. and remittent fever 11 per cent. of the total deaths. The chief causes of invaliding were anæmia and debility, rheumatism, spleen diseases, and eye diseases.

The general ratios for the various geographical sections of the Native army of Bengal are shown in the following table:—

Year.	Ratio per 1,000.													
	Bengal Proper and Assam.		Gangetic Provinces.		Rohilkhand and Meerut.		Agra and Central India.		Punjab.		Punjab Frontier Force.		Quetta District.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1867-76	1,523	19·13	1,062	8·38	987	11·19	1,583	9·61	1,459	14·24	1,680	15·88	—	—
1880	1,757	40·63	1,222	20·59	1,395	24·46	1,884	28·52	1,687	38·02	1,874	24·03	—	—
1881	1,772	22·53	1,260	15·78	1,378	15·67	1,380	9·35	1,521	22·83	1,718	17·95	—	—
1882	1,569	18·22	1,081	10·01	1,083	9·93	1,248	7·18	1,238	13·30	1,992	15·94	—	—
1883	1,408	16·23	970	8·17	978	11·53	903	5·77	830	10·80	1,419	2·46	—	—
1884	1,567	14·61	929	6·00	1,188	10·62	1,312	7·84	1,083	8·49	1,262	10·71	—	—
1885	1,278	9·96	990	6·42	1,179	10·04	1,333	8·28	902	9·92	1,152	12·67	—	—
1886	1,692	38·45	896	5·35	1,349	13·64	1,386	6·99	779	8·61	979	9·83	1,637	86·02
1887	1,462	14·32	906	7·54	1,258	21·39	1,220	8·36	894	10·33	1,687	11·87	1,545	68·54
1888	1,107	88·81	830	8·08	993	10·19	1,171	9·11	789	10·05	1,369	15·61	1,337	22·07
1889	1,199	13·38	615	8·84	833	9·56	1,146	10·80	896	8·79	1,493	14·62	1,401	24·92

The highest admission ratios were those of the Punjab Frontier Force and of the Quetta District, and the lowest was that of the Gangetic Provinces. The ratio of the Punjab Frontier Force was higher than in 1888, but lower than in the decennium; that of Quetta was higher than in 1888; that of the Gangetic Provinces was lower than in 1888, and than in the decennium. The highest death ratios were those of Quetta and the Punjab Frontier Force; and the lowest that of the Punjab. The Quetta ratio was higher than in 1888; the ratios of the Punjab Frontier Force and of the Punjab were lower than in 1888, and than in the decennium.

The geographical groups of the Bengal Native army are compared in respect of sickness from certain causes in the following table:—

Causes of Admission.	Ratio of Admission per 1,000 of Strength.						
	1.	2.	3.	4.	5.	6.	7.
	Bengal Proper and Assam.	Gangetic Provinces.	Rohilkhand and Meerut.	Agra and Central India.	Punjab.	Punjab Frontier Force.	Quetta District.
Enteric fever	—	·3	·5	—	·3	·2	1·6
Intermittent fever	519·2	185·9	345·4	503·1	445·2	882·8	840·0
Remittent fever	13·7	5·9	4·4	8·2	12·6	17·4	16·9
Simple continued fever	6·6	3·5	10·0	54·7	6·4	1·9	1·6
Dysentery	110·3	42·9	25·6	37·4	35·4	61·1	57·9
Diarrhœa	32·8	11·7	15·2	28·3	10·3	15·3	44·2
Hepatitis	1·6	1·4	1·7	2·2	1·5	·8	·8
Spleen diseases	10·3	5·3	3·9	11·7	13·0	14·1	6·4
Respiratory diseases	48·8	31·5	33·0	25·9	38·3	75·4	80·4
Phthisis pulmonalis	2·9	2·9	3·8	2·0	2·5	2·3	1·6
Rheumatism and neuralgia.	33·8	20·9	25·9	30·0	16·1	32·4	18·5
Venereal diseases	49·4	29·2	46·7	53·4	44·8	23·3	25·7
All Causes	1,198·6	614·7	832·8	1,146·0	896·3	1,492·9	1,401·1

The Punjab Frontier Force had the highest admission ratios from ague, remittent fever, and spleen diseases; Quetta the highest from enteric fever, diarrhœa, and respiratory diseases; Agra and Central India the highest from simple continued fever, hepatitic affections, and venereal diseases; Bengal Proper and Assam the highest from dysentery and rheumatism; Rohilkhand and Meerut the highest from phthisis.

In the following, again, the groups are compared in respect of certain causes of mortality:—

Causes of Death.	Ratio of Death per 1,000 of Strength.						
	1.	2.	3.	4.	5.	6.	7.
	Bengal Proper and Assam.	Gangetic Provinces.	Rohilkhand and Meerut.	Agra and Central India.	Punjab.	Punjab Frontier Force.	Quetta District.
Cholera	·44	·64	—	·74	—	—	—
Enteric fever	—	·16	·15	—	·14	—	·80
Intermittent fever	·44	·48	·76	1·12	·77	1·04	1·61
Remittent fever	2·94	·48	·61	·93	1·23	1·12	1·61
Simple continued fever	·15	—	—	—	·05	·16	—
Dysentery	1·62	·80	·15	·37	·23	·40	2·41
Diarrhœa	·15	·32	·30	·74	·18	·24	2·41
Abscess of liver	—	—	—	—	·05	—	—
Pneumonia	1·91	1·93	1·97	2·05	3·01	7·87	6·43
Phthisis pulmonalis	·29	·48	1·67	·37	1·14	·56	·80
Anæmia and debility	·44	—	1·15	—	·09	·16	1·61
All Causes	13·38	8·84	9·56	10·80	8·79	14·62	24·92

Quetta had the highest mortality from enteric fever, ague, dysentery, diarrhœa, and debility; Agra and Central India the highest from cholera; Bengal Proper and Assam the highest from remittent fever, the Punjab Frontier Force the highest from simple continued fever and from pneumonia; the Punjab the highest from abscess of the liver; and Rohilkhand and Meerut the highest from phthisis.

Of the large garrisons with a strength of not less than 1,000 the following returned death-rates higher than the presidency ratio (12·96):—Dehra Dun, 19·34; Dharmsala, 15·23; Meean Meer, 25·97; Edwardesabad, 26·36; Dera Ismail Khan, 17·32; Quetta, 22·83.

The health of the corps in Central India and Rajputana was, as regards both sickness and mortality, less satisfactory than in the previous year, the admission-rate having risen 658 to 801 per 1,000, and the death-rate from 5·54 to 7·56. The chief causes of admission were ague, injuries, and diseases of the integuments. Among the diseases which caused increased admission were all the fevers, except enteric, respiratory diseases, and venereal diseases. Among those from which admission was lessened were hepatitic affections, heat-stroke, rheumatism, and guinea-worm. Ague caused 47 per cent. of the total admission. The chief causes of death were pneumonia and remittent fever. Among the diseases which caused increased mortality were remittent fever, diarrhœa, and pneumonia. Among those from which mortality was lessened were hepatitic affections, heatstroke, circulatory diseases, and phthisis. Pneumonia caused 33 per cent. and remittent fever 13 per cent. of the total deaths.

The health of the Hyderabad Contingent was on the whole satisfactory. The admission and daily sick-rates (555 and 19 per 1,000) underwent a substantial reduction; but the death-rates from cholera (1·30) and from all causes (8·65) were increased. The chief causes of admission were ague, injuries, and diseases of the integuments. Among the diseases which caused increased admission were cholera, "other fevers," enteric fever, respiratory diseases, and scurvy. Among those from which admission was lessened were small-pox, ague, hepatitic affections, spleen diseases, and venereal diseases. Ague caused nearly 39 per cent. of the total admissions. The chief causes of death were pneumonia and cholera. Among the diseases which caused increased mortality were respiratory diseases and cholera. Among those from which mortality was lessened were remittent fever, debility, and dysentery. Pneumonia caused 28 per cent. and cholera 15 per cent. of the total deaths.

With the exception of the unusually high death-rate, the ratios of the Madras army* do not compare very unfavourably with the corresponding ratios of former years. During 1888 and 1889 service in Burma influenced unfavourably the health statistics of the Madras Native army. Madras army.

Sickness and Mortality during the last Ten Years compared.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	All Causes.	
1880	28,710	1,399	54	0·10	15·57	19·54
1881	28,533	997	41	1·37	12·02	16·75
1882	27,654	879	30	2·46	12·01	14·99
1883	27,703	737	27	2·92	10·76	12·51
1884	28,050	836	31	1·46	10·02	11·82
1885†	27,043	675	25	1·29	9·69	13·96
1886‡	22,070	756	30	2·54	14·05	21·25
1887‡	20,031	772	32	1·49	11·53	22·22
1888‡	25,671	886	36	4·17	15·31	20·10§
1889	26,808	856	37	1·45	19·21	23·99

† Excluding men on active service in Burma and Egypt. ‡ Excluding men on active service in Burma.
§ Including deaths in Upper Burma for the first three months of the year.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases which caused increased admission were small-pox, remittent fever, dysentery, respiratory diseases, and venereal diseases. Among those from which admission was lessened were cholera, ague, diarrhœa, and guinea-worm. Ague caused 37 per cent. of the total admissions. The chief causes of death were debility, remittent fever, ague, diarrhœa, dysentery, cholera, and pneumonia. Among the diseases which caused increased mortality were small-pox, ague, diarrhœa, spleen diseases, scurvy, debility, remittent fever, and dysentery. Among those from which mortality was lessened were cholera, hepatitis, and enteric fever. Debility caused 16 per cent. and remittent fever 11 per cent. of the total deaths. The chief causes of invaliding were anæmia and debility, and rheumatism.

Of the large garrisons of over 1,000 in strength the following returned death-rates over the presidency ratio (19·21) of the year:—Bellary 25·64, and Mandalay, 48·12.

The following table compares the statistics of Upper Burma with those of Lower Burma. It also compares the statistics of the four corps serving in Upper Burma:—

Sickness and Mortality during 1889 *compared.*

——	Average Strength.	Ratio per 1,000 of Strength.			
		Admissions into Hospital.	Daily Sick.	Deaths from	
				Cholera.	All Causes.
Bengal Troops in Upper Burma	3,246	2,591	95	2·16	44·98
Madras „ „ „	5,381	1,710	66	—	50·36
Bombay „ „ „	238	1,193	63	—	16·81
Hyderabad Contingent „	56	821	36	—	53·57
Upper Burma as a whole	8,921	2,011	77	0·78	47·53
Lower Burma and Andamans (Madras troops).	2,678	667	48	—	12·32

* The returns for troops serving in Burma are not complete.

Bombay Army.

The improvement in the health of the Native army of Bombay* noted in the last two years' reports was still farther advanced in the year under review. All the ratios shown in the following table were lower than the corresponding ratios of 1888 :—

Sickness and Mortality during the last Ten Years compared.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	All Causes.	
1880*	15,328	1,283	45	—	10·44	56·53‡
1881	18,349	1,166	41	1·85	14·01	25·93‡
1882†	23,772	1,067	36	0·46	12·16	13·41
1883	23,576	994	35	0·47	12·81	14·96
1884	23,373	1,153	38	0·39	12·96	14·35
1885§	22,701	1,243	43	5·42	24·84	26·01
1886§	21,089	1,231	37	0·14	15·98	20·89
1887§	20,353	1,092	34	0·69	11·50	15·45
1888‖	23,570	1,080	35	1·57	10·52	13·37¶
1889	23,993	1,024	33	0·58	8·13	10·74

* Excluding Afghanistan. † Including troops in Southern Afghanistan.
‡ These ratios are calculated on the total regimental strength, including the army in Afghanistan.
§ Excluding men on active service in Burma and Egypt.
‖ Excluding men on active service in Burma for the first three months of the year.
¶ Including deaths in Burma in the first three months of the year.

The chief causes of admission were ague, diseases of the integuments, injuries, dysentery, and venereal diseases. Among the diseases which caused increased admission were small-pox, ague, enteric fever, remittent fever, and venereal diseases. Among those from which admission was lessened were cholera, simple continued fever, bowel complaints, respiratory diseases, scurvy, and guinea-worm. Ague caused 44 per cent. of the total admissions. The chief causes of death were pneumonia, and, at an interval, remittent fever and cholera. Among the diseases which caused increased mortality were hepatitis, injuries, enteric fever, and simple continued fever. Among those from which mortality was lessened were cholera, small-pox, remittent fever, bowel complaints, and debility. Pneumonia caused 26 per cent. and remittent fever 10 per cent. of the total deaths. The chief causes of invaliding were anæmia and debility, respiratory diseases, and syphilis and gonorrhœa.

Of the large garrisons with a strength of over 1,000 the following returned death-rates over the presidency ratio for the year (8·13) :—Jacobabad 12·73, Quetta 14·77, Deesa 8·40.

Of the geographical groups of Madras and Bombay the Konkan had the highest admission-rate from enteric fever and phthisis; the Bombay troops in Quetta the highest from ague and respiratory diseases; the Northern Division, Bombay, from remittent fever; Aden and Sind from hepatitis and simple continued fever; the Bombay troops in Burma from dysentery, phthisis, and venereal diseases; the Madras troops in Upper Burma from diarrhœa, spleen diseases, rheumatism, and all causes. The Northern Division of the Madras army had the highest death-rate from cholera; the Madras troops in Upper Burma from ague, remittent fever, spleen diseases, dysentery, diarrhœa, debility, and all causes; the Konkan from simple continued fever and abscess of the liver; the Bombay troops in Quetta from pneumonia; and Aden and Sind from phthisis.

Having considered individually the health statistics of the several portions of the Native army of India in the foregoing paragraphs, it will now be convenient to contrast

* The returns of this army are not quite complete.

the main features of each division, and for ready reference the chief results are brought together in the following table :—

Presidency.	Total Deaths per 1,000, including Absentees.	Average Strength present with Regiments.	Ratio per 1,000.			
			Admissions into Hospital.	Daily Sick.	Deaths from Cholera.	Present Deaths from all Causes.
Bengal Native army - -	16·30	65,360	1,116	37	·38	12·96
Madras „ „ - -	23·99	26,808	856	37	1·45	19·21
Bombay „ „ - -	10·74	23,993	1,024	33	·58	8·13
Corps of Central India and Rajputana	9·29	5,159	801	21	—	7·56
Hyderabad Contingent - -	9·48	6,933	555	19	1·30	8·65
India - - -	16·19	128,642	1,003	35	·68	12·94

As usual, the health of the Hyderabad Contingent and of the corps of Central India and Rajputana was on the whole best. Sickness was greatest in the Bengal army, mortality in the army of Madras.

To fevers returned as malarial were due 48 per cent. of the sickness and 19 per cent. of the mortality of the Native army. Both the admission and death ratios per 1,000 of strength from these fevers rose in 1889. Fevers.

The ratio of admission from enteric fever in the Native army in 1889 was 0·2 per 1,000 of strength. Since, at least, 1880 this ratio has never been higher than 0·3, and has usually been 0·2. In the same period the extreme mortalities were 0·14 and 0·04. The mortality of 1889 was 0·07 against 0·06 in the previous year. The following table shows that the ratios for European troops are very unlike those for Native troops and prisoners. *Post-mortems* are rarely obtained in the case of Native soldiers; but among prisoners nearly every fatal case is subjected to *post-mortem* examination. Under these circumstances the fact that the ratios of prisoners and sepoys for a 10-year period are practically identical appears to show that the Native troops really suffer less than the European :—

	1877 to 1886.		1889.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops - - - - -	8·9	3·15	22·9	6·11
Native troops - - - - -	·2	·10	·2	·07
Jail population - - - - -	·2	·10	·4	·16

Again, the following table shows that the fever-mortality in the European and Native armies is not the same in amount :—

Fever Mortality of Native Troops compared with that of European Troops in 1889.

Causes of Deaths.	Died per 1,000 of average Strength.		Relative Liability in Percentages.			Percentage in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total: 100.	European Troops.	Native Troops.
Ague - - - -	·19	1·11	14·6	85·4	100	1·1	8·6
Remittent fever - -	·59	1·49	29·6	70·4	100	3·6	10·8
Simple continued fever - -	·03	·09	25·0	75·0	100	·2	·7
Enteric fever - - -	6·11	·07	98·9	1·0	100	36·8	·5
Total - -	6·92	2·67	72·2	27·8	100	41·7	20·6

The total fever-mortality among Native troops in 1889 was to the total fever-mortality among European troops as 1 : 2·6. For the period 1877–86 the corresponding ratio was 1 : 1·4, and for 1888 1 : 2·2. Again, among European troops 42 per cent. of all deaths were from fevers; only 21 per cent. among Native troops in

1889. It appears then that Native soldiers and prisoners are less liable to contract enteric fever than Europeans are. This might be due to:—1*st*—Racial peculiarity; 2*nd*—Tolerance acquired in lapse of time, generation after generation living saturated in filth. 3*rd*—Comparative immunity of Native adults as a result of prevalence of the disease among Native children. This last explanation is put forward by Brigade-Surgeons Hamilton and Cleghorn and Surgeon-Major Holmes of Lucknow as probable from facts in their experience. But the point cannot be settled till more is accurately known regarding the infantile diseases of Natives.

In the whole Native army of India 25 cases with nine deaths were returned as enteric fever, as against 17 with seven in 1888. Of the deaths six were in the Bengal army, two in the Bombay army, and one in the Madras army.

Respiratory diseases.

As respiratory disease is the chief cause of death in the Native army, the following is introduced to compare the present with the past in respect thereof:—

Period.	Ratio per 1,000 of Strength.											
	India.		Bengal.*		Corps of Central India and Rajputana.		Hyderabad Contingent.		Bombay.		Madras.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1881–85	56	4·24	56	4·15	38	3·37	25	1·40	91	6·73	27	1·53
1886	51	3·68	51	3·28	34	2·10	23	·94	81	7·11	28	1·99
1887*	45	3·08	49	3·57	29	1·88	22	·99	69	4·42	20	1·20
1888*	39	2·68	41	3·70	22	1·53	22	·96	59	2·50	22	1·01
1889*	42	3·14	46	4·03	43	2·71	26	2·59	57	2·55	25	1·79

* Including Punjab Frontier Force.

All the ratios were unfavourable, the comparison with the past being worst in the case of the Hyderabad Contingent. The highest admission and death-rates were in the Quetta district and the stations occupied by the Punjab Frontier Force.

The following table gives the admission and death-rates per 1,000 from pneumonia in 1889, and shows a general deterioration:—

Period	India.		Bengal.		Madras.		Bombay.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1888	9·1	2·21	11·9	3·02	3·7	1·00	8·2	2·03
1889	11·9	2·66	15·4	3·43	4·8	1·38	8·8	2·13

Then follows a table from which may be seen at a glance the incidence of mortality from pneumonia in the various geographical groups:—

Deaths from Pneumonia.

	Burma, Bengal Troops.	Bengal Proper and Assam.	Gangetic Provinces.	Rohilkhand and Meerut.	Agra and Central India.	Punjab.	Punjab Frontier Force.	Quetta District, Bengal Troops.	Bengal Presidency.	Corps of Central India and Rajputana.	Aden and Sind.	Quetta District, Bombay Troops.	Northern Division, Bombay.	Konkan.	Burma, Bombay Troops.	Hyderabad, Nagpur, Khandeish, and Deccan.	Northern Division, Madras.	Lower Burma and Andamans.	Upper Burma, Madras Troops.	Madras Presidency.	Bombay Presidency.	Hyderabad Contingent.	Army of India.
Death-rates per 1,000 of average annual strength.	·62	1·91	1·93	1·97	2·05	3·01	7·87	6·43	3·43	2·52	1·90	6·32	1·59	·60	—	1·01	·91	—	3·16	1·38	2·13	2·45	2·66
Percentages in total deaths.	11·76	20·00	21·05	12·62	19·64	19·94	21·77	27 59	19·98	11·82	26·09	24·04	20·60	33·33	—	17·32	14·29	—	45·95	26·87	20·82	24·29	20·2

It shows well the high mortality from pneumonia in the Quetta district and on the Punjab frontier. It also shows the high percentage of pneumonia to the total death-causes in those regions, as well as in Burma and in Sind. Again, from the following it may be gathered that in 1889 the mortality of Native soldiers from pneumonia was nearly six times as great as that of European soldiers:—

Cause of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentages in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	*Total* 100.	European Troops.	Native Troops.
Pneumonia - -	·46	2·66	14·7	85·3	100	2·8	20·5

Jails.

There was a very considerable augmentation, as shown in the subjoined table, of the jail population in 1889, whether the figures of the sub-jails be included or excluded. The admission- and death-rates were rather high as compared with others in the table; the daily six-rate was usual; the death-rate from cholera was high, but lower than in the preceding year; while the death-rate from bowel diseases was higher than in 1888, but not out of the common. Sickness and mortality in 1889.

Statement showing the Strength, Sickness, and Mortality among the Prisoners of India during the years 1872–76, 1877–81, 1882–86 *and* 1887 *to* 1889.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
1872-76 - -	99,758	1,016	?	2·86	13·48	36·24
1877–81 - -	112,670	1,189	45	4·48	24·97	63·01
1882–86 - -	87,059	1,056	38	2·27	11·56	33·29
1887 - -	79,468	1,083	37	4·08	11·53	34·15
1888 - - -	91,445	1,129	38	4·68	10·55	35·57
1889* - - -	96,121	1,155	38	4·52	10·86	36·56
* Including subsidiary jails	98,720	1,152	38	—	—	36·63.

The chief causes of admission were ague, dysentery, diarrhœa, and abscess and ulcer. Among the diseases which caused increased admission were small-pox, enteric fever, malarial fevers, bowel complaints, and respiratory diseases; among those from which admission was lessened were simple continued fever, "other fevers," debility, and scurvy. Ague caused 43 per cent. of the total sickness. The chief causes of death were, in order, dysentery, pneumonia, cholera, diarrhœa, and phthisis. Among the diseases which caused increased mortality were small-pox, enteric fever, diarrhœa, hepatic abscess and inflammation, spleen diseases, and respiratory and circulatory diseases; among those from which mortality was lessened were cholera, fevers, and dysentery. Thirty per cent. of the deaths were from bowel diseases.

The following statement shows for each Presidency the proportion of prisoners to each 10,000 of the population; the population, that is to say, according to the census of 1881 :—

Ratio of Prisoners per 10,000 *of Population in each of the three Presidencies for* 1889, 1888, 1887, 1886, 1885, *and* 1872–76 *compared.*

Presidency.	Period.	General Population, according to Census of 1881.	Prisoners.		
			Average Number.	Proportion to 10,000 of Population.	Deaths per 1,000 of Average Strength.
Bengal	1872–76	147,215,384	68,328	4·6	39·39
	1885		49,404	3·4	38·40
	1886		50,028	3·4	32·32
	1887		47,306	3·2	36·36
	1888		54,434	3·7	33·93
	1889		58,051	3·9	34·84
Madras	1872–76	31,170,631	9,607	—	32·37
	1885		6,942	2·2	17·86
	1886		6,904	2·2	17·53
	1887		6,057	1·9	22·12
	1888		7,880	2·5	27·64
	1889		8,392	2·7	39·49
Bombay	1872–76	16,454,414	8,011	4·9	26·61
	1885		6,872	4·2	33·76
	1886		6,767	4·1	30·44
	1887		5,667	3·4	19·06
	1888		6,521	4·0	22·24
	1889		7,461	4·5	31·36

The following table compares the sickness and mortality of the prison populations of the three presidencies :—

Sickness and Mortality among Prisoners in the three Presidencies during 1889 *compared.*

Presidency.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Daily Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
Bengal	56,864	1,125	37	3·97	10·76	34·84
Madras	7,267	69	28	11·83	11·97	39·49
Bombay	7,174	727	24	4·04	7·25	31·36

The highest admission and daily sick ratios were in Bengal; the highest death-rates from cholera, bowel diseases, and all causes in Madras. In the Bengal Presidency the diseases of which the ratios of admission increased most were ague and respiratory diseases; in the Madras Presidency the disease which increased its mortality ratio most was cholera, most of the other principal diseases, except diarrhœa, respiratory diseases, and debility, having lower ratios than in the previous year. The cholera death ratio of Madras rose from 1·48 to 11·83.

The admission and daily sick-rates for the Bengal Presidency were higher than they had been since 1882. The death-rate was higher than in the preceding year, there having been since 1883 a regular alternation of higher and lower, the ratio never rising above 38·40 nor falling below 32·32.

Chief causes of sickness in the Bengal Presidency.

The chief causes of admission in the Bengal Presidency in 1889 were ague, bowel complaints, abscess and ulcer, and respiratory diseases. The greatest increase was in ague and respiratory diseases; but, with the exception of cholera, "other fevers," debility, scurvy, rheumatism, and eye diseases, the other principal diseases had also higher ratios. Ague caused 43 per cent. of the total sickness.

The following is a comparative statement of the chief forms of sickness in 1889 and other years:—

Statement showing the Chief Diseases which have caused Admissions into Hospital in the Jails of the Bengal Presidency from 1880–89.

Number.	Diseases.	Decennial Average, 1873–82.	Admitted per 1,000 of Average Strength.									
			1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.
1	Fevers (including small-pox)	490	516	492	441	406	442	454	390	542	529	459
2	Dysentery - -	112	111	106	118	122	137	117	100	117	105	116
3	Diarrhœa - -	103	104	98	93	103	111	106	100	108	106	117
4	Respiratory diseases -	44	56	45	49	44	40	36	39	45	48	48
5	Anæmia and debility -	23	20	29	34	36	34	28	27	28	28	28
6	Rheumatism - -	17	13	14	15	15	16	16	16	16	15	15
7	Eye diseases - -	13	17	18	15	17	14	13	13	15	13	14
	Total of the Seven -	802	837	802	765	743	794	770	685	871	844	797
	Total from all Causes -	1,091	1,125	1,079	1,020	1,003	1,060	1,028	949	1,178	1,151	1,108

The ratios of the first four diseases were above the corresponding ratios of 1888; those of the first, third, fourth, and seventh were above the decennial average.

The chief causes of mortality were dysentery, pneumonia, cholera, diarrhœa, and phthisis. Small-pox, enteric fever, "other fevers," apoplexy, bowel diseases, and hepatic, respiratory, and circulatory diseases gave rise to higher mortality than in the previous year, while less mortality occurred from most of the other chief diseases. Bowel complaints caused 11 per cent. of the total mortality. The following is a comparative statement of the principal causes of death in 1889 and other years:—

Statement showing the Diseases which have been the chief causes of Mortality amongst Prisoners of the Bengal Presidency from 1880–89.

Number.	Diseases.	Decennial Average, 1873–82.	Died per 1,000 of Average Strength.									
			1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.	1880.
1	Dysentery and diarrhœa -	18·90	10·76	10·17	13·19	11·81	14·68	12·66	12·93	17·31	17·91	21·51
2	Respiratory diseases -	7·18	7·56	6·54	6·87	6·85	5·83	6·03	6·00	7·26	7·62	9·38
3	Fevers* - - -	5·40	2·85	3·09	2·58	2·82	2·57	2·30	2·49	3·58	4·70	4·46
4	Cholera - - -	3·46	3·97	4·17	4·21	1·78	4·07	1·32	2·35	3·11	3·10	1·00
5	Anæmia and debility -	3·10	1·65	2·20	2·05	2·60	2·49	2·10	2·02	3·04	2·58	3·66
6	Phthisis pulmonalis -	2·50	2·09	2·17	1·86	2·24	2·41	2·12	2·31	1·98	2·24	2·53
7	Spleen diseases - -	0·35	0·16	0·28	0·39	0·38	0·20	0·27	0·34	0·19	0·22	0·57
	Total of the Seven	40·89	29·04	28·62	31·08	27·48	32·25	27·00	28·44	36·47	38·37	43·11
	Total from all Causes -	47·36	34·84	33·93	36·36	32·32	38·40	32·71	34·28	42·36	44·42	51·12

* Including small-pox.

The ratios of only the first and second were above the corresponding ratios of 1888, of only the second and fourth above the decennial average. The death-rates from dysentery and diarrhœa separately were as follows compared with the previous year:—

	Ratio per 1,000 of Average Strength.	
	1889.	1888.
Dysentery - - - -	7·35	6·96
Diarrhœa - - -	3·41	3·21
	10·76	10·17

Thirty-one per cent. of all deaths were from those diseases.

There were 6 deaths from enteric fever against 1 in the previous year; 31 from cerebro-spinal fever against 25; and 7 from typhus against 6.

As regards sickness in the geographical groups of the Bengal Presidency, the Punjab and Bengal Proper and Assam were worst; while as regards mortality, the worst were the Central Provinces and Bengal Proper and Assam. The best with regard to sickness were Agra and Central India and the Central Provinces, and the best with regard to mortality Rohilkhand and Meerut and Agra and Central India.

The various jail administrations of India are compared in the following tables in respect of total mortality, and of the mortality from certain diseases:—

Statement showing the Diseases which have been the chief causes of Mortality amongst Prisoners of the different administrative areas during the year 1889.

Causes of Death.	Died per 1,000 of Average Strength.									
	Convict Settlement, Andamans.	Burma.	Assam.	Bengal.	North-western Provinces and Oudh.	Punjab.	Bombay.	Berar.	Central Provinces.	Madras.
Cholera	—	8·05	5·60	7·28	1·87	·23	4·04	—	15·15	11·83
Fevers	4·76	6·84	2·40	4·74	1·61	2·71	3·21	1·86	3·96	1·11
Pneumonia	2·46	2·34	4·00	3·89	5·39	11·61	5·30	2·79	6·15	1·65
Dysentery and diarrhœa	11·32	13·07	26·38	16·90	9·25	4·03	7·25	3·72	14·93	11·97
Phthisis pulmonalis	4·84	3·64	—	3·54	1·57	2·09	1·81	1·86	1·10	1·79
Anæmia and debility	2·21	2·42	3·20	1·91	1·82	·46	1·95	—	3·07	3·58
All causes	35·52	49·09	51·96	44·77	28·37	29·19	31·36	19·53	51·37	39·49

The Andamans had the highest mortality from phthisis, and were (as always) free from cholera; Burma had the highest mortality from fevers; Assam the highest from all causes and from bowel complaints, and the lowest from phthisis; the Punjab the highest from pneumonia; Berar the lowest from all causes from bowel complaints, from debility, and no cholera; the Central Provinces the highest from cholera; Madras the highest from debility, and the lowest from fevers and pneumonia.

Though the admission-rate of the convict settlement of the Andamans was considerably increased, yet the daily sick-rate and the death-rates from bowel complaints and from all causes were diminished, showing that the extra sickness was of a mild nature. The chief causes of admission were ague, abscess, ulcer and boil, dysentery, respiratory diseases, and remittent fever. Among the diseases which caused increased admission were ague, remittent fever, dysentery, debility, and rheumatism; among those from which admission was lessened were diarrhœa, hepatic and splenic affections, respiratory diseases, phthisis, scurvy, and eye-diseases. Ague caused 61 per cent. of the total sickness. The chief causes of death were dysentery, phthisis, remittent fever, diarrhœa, pneumonia, and debility. Among the diseases which caused increased mortality were hepatic and splenic affections, respiratory diseases, scurvy, and debility; among those from which mortality was lessened were ague, remittent fever, bowel complaints, circulatory diseases, and phthisis. Bowel complaints caused 32 per cent. of the total mortality.

The health of the Burmese jails decidedly improved in 1889, all the ratios being lower than those of the previous year. The chief causes of admission were ague, dysentery, simple continued fever, abscess, ulcer and boil, and diarrhœa. Among the diseases which caused increased admission were small-pox (8·5 per 1,000 against 1·2), enteric fever (1·0 against 0·1), ague, remittent fever, bowel complaints, spleen diseases, and phthisis; among those from which admission was lessened were cholera, simple continued and "other" fevers, hepatic and respiratory affections, debility, and scurvy. Bowel complaints caused 20 per cent. of the total sickness. The chief causes of death were dysentery, cholera, diarrhœa, phthisis, and small-pox. Among the diseases which caused increased mortality were small-pox, enteric fever, remittent fever, diarrhœa, and phthisis; among those from which mortality was lessened were cholera, dysentery, intermittent, and simple continued fevers, respiratory diseases, scurvy, and debility. Bowel complaints caused 27 per cent. of the total mortality.

The jails of Upper Burma are distinguished from those of Lower Burma by being new jails on new sites; mostly officered by new officials, who have to create arrangements; in more or less unsettled districts; apt to be unavoidably overcrowded; receiving often prisoners broken down by exposure in the jungles. The following

compares the jails of Upper and Lower Burma with regard to mortality from certain diseases.

	Deaths per 1,000 of Strength from						
	Cholera.	Fevers.	Pneumonia.	Dysentery and Diarrhœa.	Phthisis pulmonalis.	Anæmia and debility.	All causes.
Upper Burma - -	1·57	14·92	4·32	23·96	2·75	4·32	76·98
Lower Burma - -	9·88	4·55	1·78	10·00	3·89	1·89	41·20

The Moulmein Central Prison was visited severely by cholera,—110 cases with 70 deaths; and the Mandalay jail by small-pox, 33 cases with 14 deaths. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of Burma:—Moulmein (Central), 179·44; Minbu, 151·72; Tavoy, 84·75; Maubin, 67·38; Mandalay, 53·54; Myingyan (Central), 52·76.

Although the admission-rate (1,955) was somewhat reduced, the health of the prisoners of Assam was bad, as is seen from the enormous increase in the death-rate from all causes (from 29·57 to 51·96), and from bowel complaints (from 10·32 to 26·38), and in the cholera death-rate (5·60). The chief causes of admission were ague, bowel complaints, diseases of the integuments, respiratory diseases, and spleen diseases. Among the diseases which caused increased admission were cholera, respiratory diseases, bowel complaints, and spleen affections; among those from which admission was lessened were simple continued fever, ague, remittent fever, phthisis, debility, and scurvy. Ague caused 35 per cent. of the total sickness. The chief causes of death were bowel complaints, cholera, pneumonia, and debility. Among the diseases which caused increased mortality were bowel complaints, respiratory diseases, cholera, ague, spleen diseases, and scurvy; among those from which mortality was lessened were remittent fever, circulatory diseases, phthisis, and debility. Bowel complaints caused 51 per cent. of the total mortality. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of Assam—Telikhal, temporary, 73·39; Sylhet, 66·88.

On the whole, the health of the prisoners of Bengal did not change much, as compared with the previous year. The admission-rate (1,265) was lower, the death-rate (16·90) slightly higher. The daily sick-rate was higher, as was also the death-rate from bowel complaints, while the death-rate from cholera was lower. The chief causes of admission were ague, bowel complaints, and diseases of the integuments. Among the diseases which caused increased admission were bowel complaints, small-pox, enteric fever, simple continued fever, and spleen affections; among those from which admission was lessened were cholera, ague, remittent fever, "other fevers," respiratory diseases, phthisis, and debility. Ague caused 36 per cent. of the total sickness. The chief causes of death were bowel complaints, cholera, pneumonia, and phthisis. Among the diseases which caused increased mortality were small-pox, enteric fever, bowel complaints, and respiratory diseases; among those from which mortality was lessened were cholera, ague, remittent fever, spleen diseases, phthisis, debility, and scurvy. Bowel complaints caused 38 per cent. of the total mortality. Of the jails with a strength of not less than 100, 18 returned death-rates higher than the ratio for the administration of Bengal, ranging from 131·43 in Chittagong to 45·31 in Dacca.

The health of the prisoners of the North-western Provinces and Oudh was improved as compared with the previous year. The admission-rate (742), daily sick-rate (22), and general death-rate (28·37) were all diminished, though the death-rates from cholera and bowel diseases were somewhat higher. The chief causes of admission were ague, abscess, ulcer, and boil, and bowel complaints. Among the diseases which caused increased admission were cholera, enteric fever, remittent fever, bowel and hepatic complaints, spleen diseases, respiratory diseases, phthisis, and scurvy; among those from which admission was lessened were ague, simple continued fever, "other fevers," and debility. Ague caused 34 per cent. of the total sickness. The chief causes of death were bowel and respiratory diseases. Among the diseases which caused increased mortality were cholera, enteric fever, bowel complaints, hepatic and respiratory affections, circulatory diseases, and phthisis; among those from which mortality was lessened were ague, simple continued and "other" fevers, spleen diseases, debility, and scurvy. Bowel

complaints caused 33 per cent. of the total mortality, and respiratory affections 23 per cent. Of the jails with a strength of not less than 100, 18 returned death-rates higher than the ratio for the administration of the North-western Provinces and Oudh, ranging from 109·97 in Allahabad District Jail, to 28·47 in Saharanpur.

Although the admission and daily sick-rates (1,682 and 38) of the Punjab jails were much increased, yet the death-rate (22·19) was lowered. The increased sickness was, therefore, not of a deadly nature. The chief causes of admission were ague, abscess, ulcer and boil, diarrhœa, respiratory affections, and dysentery. Among the diseases which caused increased admission were ague, simple continued fever, bowel and respiratory diseases, and tonsillitis; among those from which admission was lessened were cholera, remittent fever, spleen diseases, debility, and scurvy. Ague caused 59 per cent. of the total sickness. The chief causes of death were pneumonia, diarrhœa, phthisis, and dysentery. Among the diseases which caused increased mortality were respiratory diseases and phthisis; among those from which mortality was lessened were cholera, remittent fever, and dysentery. Pneumonia caused 40 per cent. of the total mortality. Of the jails with a strength of not less than 100, 11 returned death-rates higher than the ratio for the administration of the Punjab, ranging from 68·97 in Peshawar to 29·57 in Delhi.

As compared with what it was in the previous year, the health of the prisoners of Bombay was bad. All the ratios were much increased. The chief causes of admission were ague, bowel complaints, abscess, ulcer and boil, and respiratory diseases. Among the diseases which caused increased admission were small-pox, simple continued fever, heatstroke, cholera, malarial fevers, and scurvy; among those from which admission was lessened were "other fevers," debility, rheumatism, and guinea-worm. Ague caused 27 per cent. of the total sickness. The chief causes of death were pneumonia, dysentery, cholera, and diarrhœa. Among the diseases which caused increased mortality were cholera, small-pox, heatstroke, dysentery, respiratory diseases, phthisis, and malarial fevers; among those from which mortality was lessened were circulatory diseases, scurvy, debility, and "other fevers." Pneumonia caused 17 per cent. of the total mortality, and dysentery and cholera about 13 per cent. each. As in the previous year, none of the fever cases occurring in the Bombay jails were returned as enteric. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of Bombay—Hyderabad, 77·51; Nara, 56·56; Bijapur (Gang), 43·31; Ahmedabad, 43·05; Bombay (Common), 33·58; Kaira, 32·47; Shikarpur, 31·75.

There was less sickness among the prisoners of Berar than in the previous year, though a larger proportion of the prisoners died. As in 1888 the Berar jails were free from cholera in 1889. The chief causes of admission were ague and bowel complaints. Among the diseases which caused increased admission were simple continued fever, phthisis, guinea-worm, dysentery, and debility; among those from which admission was lessened were spleen affections, respiratory diseases, malarial fevers, and scurvy. Ague caused 46 per cent. of the total sickness. The chief causes of death were pneumonia and dysentery. Among the diseases which caused increased mortality were dysentery, phthisis, respiratory diseases, and the diseases classed as "all other causes"; among those from which mortality was lessened were debility, diarrhœa, and hepatic affections. Pneumonia and dysentery caused 14 per cent. each of the total mortality. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of Berar—Akola, 23·81; Amraoti, 20·83.

The health of the prisoners of the Central Provinces was bad, as compared with what it was in the previous year. The admission and general death-rates (946 and 51·37) were much heightened; the cholera death-rate was increased, the death-rate from bowel complaints was diminished, while the daily sick-rate remained unchanged. The chief causes of admission were ague, bowel complaints, and abscess, ulcer and boil. Among the diseases which caused increased admission were cholera, small-pox, simple continued fever, malarial fevers, and respiratory diseases; among those from which admission was lessened were bowel complaints, debility, scurvy, rheumatism, and guinea-worm. Ague caused 40 per cent. of the total sickness. The chief causes of death were cholera, bowel complaints, pneumonia and debility. Among the diseases which caused increased mortality were cholera, all fevers, and respiratory diseases; among those

from which mortality was lessened were bowel complaints, hepatic and splenic affections, circulatory diseases, phthisis, debility, and scurvy. Cholera and bowel complaints caused each about 29 per cent. of the total mortality. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of the Central Provinces — Saugor, 168·37; Sambalpur, 141·87; Hoshangabad, 128·49; Bilaspur, 100·00.

As compared with what it was in the previous year, the health of the prisoners of Madras was bad. For, though the admission-rate (698) was reduced, the daily sick-rate (28), the general death-rate (39·49), and the death-rates from cholera and bowel complaints were much increased. The chief causes of admission were diarrhœa, ague, and dysentery. Among the diseases which caused increased admission were cholera, simple continued fever, bowel complaints, respiratory diseases, scurvy, and rheumatism; among those from which admission was lessened were spleen affections, malarial fevers, small-pox, phthisis, and debility. Bowel complaints caused 29 per cent. of the total sickness, and ague 17 per cent. The chief causes of death were cholera, diarrhœa, dysentery, and debility. Among the diseases which caused increased mortality were cholera, diarrhœa, respiratory diseases, and debility; among those from which mortality was lessened were fevers, dysentery, and phthisis. Cholera and bowel complaints caused each 30 per cent. of the total mortality. The following jails with a strength of not less than 100 returned death-rates higher than the ratio for the administration of Madras—Coimbatore, Central, 103·09; Parvatipur, 81·82; Palamcottah, 70·09; Trichinopoly, Central, 70·42; Vizagapatam, 68·63; Russellkonda, 60·11; Berhampur, 47·62; Calicut, 42·86.

General Population.

General remarks.

With regard to the registration of births, the best results were obtained in the Punjab, Berar, Central Provinces, North-Western Provinces, and Oudh, and the Bombay Presidency in the above order. In these provinces the birth-rate varied from 40·28 to 36·49. In the remaining provinces the ratios varied from 31·20 in Assam to 16·36 in Coorg. In Bengal birth registration is still confined to certain selected municipalities, 137 in all, and among these the ratio was 22·76, evidently considerably under the truth. The carelessness with which birth registration is carried out in this province is further illustrated by the very large difference between the highest and lowest ratios recorded in any single municipality, namely, a difference of 48·50. This is the largest difference exhibited by any province, the next largest being 37·66 in Punjab, 30·82 in Bombay, 25·26 in North-Western Provinces and Oudh, and 24·1 in the Madras Presidency. The smallest differences, indicating, therefore, more careful general registration, were 9·0 in Berar, 15·93 in Central Provinces, 18·23 in Assam, and 20·93 in Lower Burma (excluding Mysore and Coorg, where registration is still immature). The number of males born to every 100 females varied from 103·13 in Coorg to 115·4 in Punjab. In seven provinces the births exceeded the deaths, whilst in four the reverse was the case.

The mean death-rates in the several provinces varied from 43·79 in Central Provinces to 17·07 in Lower Burma. The highest ratios were recorded in Central Provinces (43·79), Berar (42·5), and Punjab (32·0), whilst the lowest were Lower Burma (17·07), Mysore (18·23), Coorg (22·92), Madras (23·5), and Bengal (24·25). The death-rates were greater in every province except Lower Burma than in the preceding year, and especially in the Central Provinces and Berar. The highest mortality ratios for cholera were recorded in Central Provinces (5·96), Berar (4·2), and Assam (4·04); for small-pox in Central Provinces (1·99), Mysore (1·28), North-Western Provinces and Oudh (1·09), and Madras (1·0): for fevers in North-Western Provinces and Oudh (23·10), Central Provinces (23·03), and Punjab (22·75); for bowel complaints in Berar (6·6), Assam (3·55), Central Provinces (2·94), and Bombay (2·93). In the following table deaths from all causes by months are shown :—

Statement showing the Deaths from All Causes according to months in the different Provinces of India during the year 1889.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1889.	1888.
Bengal - - -	125,953	96,187	113,505	157,301	114,896	108,659	138,050	126,815	135,179	148,610	147,795	184,528	1,597,478	24·25	22·94
Assam - - -	9,214	8,254	11,915	15,463	13,685	12,825	11,391	10,993	10,862	11,114	11,118	12,152	138,986	30·70	27·98
North-Western Provinces and Oudh.	106,354	82,096	83,889	109,148	119,330	112,192	102,030	124,430	129,217	147,492	133,546	122,735	1,372,269	31·11	30·08
Punjab - - -	46,825	37,014	34,880	34,639	42,549	42,113	37,456	41,314	53,218	72,618	79,842	73,292	595,760	31·62	29·89
Central Provinces - -	20,690	20,585	26,498	28,285	35,342	40,869	39,182	46,583	37,494	34,481	30,982	25,164	386,155	43·79	28·70
Berar - - -	5,806	5,955	8,343	10,602	9,040	7,295	10,014	15,203	12,872	10,799	8,731	6,896	111,556	42·5	24·7
Lower Burma - -	5,250	4,224	4,513	4,853	5,056	4,839	6,241	6,243	5,603	4,921	5,103	5,512	62,358	17·07	23·40
Madras Presidency -	65,759	47,406	48,016	48,158	53,962	56,621	64,638	60,467	51,988	51,283	50,875	62,005	661,178	23·5	21·4
Bombay Presidency -	37,601	32,686	39,530	44,725	45,337	41,647	49,435	52,845	46,016	46,651	43,121	39,018	518,562	31·51	28·44
Mysore - - -	6,259	5,211	5,873	5,952	5,471	5,981	6,602	6,259	6,092	6,299	6,950	7,669	74,618	18·23	17·30
Coorg - - -	358	292	241	269	331	585	469	373	364	279	261	265	4,087	22·92	19·41
Total - -	430,069	339,860	377,213	459,395	444,999	433,626	465,508	491,525	488,905	534,547	518,124	539,236	5,523,007		

In Bengal births were registered in 137 municipalities against 134 in the preceding year. There is little evidence of improvement in the correctness of the work done, the ratio having been 22·76 against 20·63 per 1,000, both evidently much under the truth. The imperfection is forcibly shown in the large difference between the maximum and minimum ratios contributing to the mean, the former being 52·22, and the latter 3·72 per 1,000. Deaths, on the other hand, are registered throughout the province. The deaths exceeded the births registered by 3·18 per 1,000 of population. The mean death-rate was 24·25 per 1,000 (also manifestly under-stated against 22·94 in 1888 and 23·32 the mean of the preceding five years). The maximum ratio in any district was 45·22 and the minimum 16·02. In Calcutta the birth-rate was 20·20 against 19·95 in the previous year, and the death-rate 26·73 against 26·97. The rural and urban death-rates were much the same for the province, namely, 24·22 for the former, and 25·03 for the latter. In 35 of the 45 districts of this province the death-ratios exceeded the quinquennial averages.

The birth-rate for the North-Western Provinces and Oudh was 36·93, showing a continued reduction upon the ratios of the two preceding years. The district ratios varied from 50·26 to 25·00, and this wide range would indicate very imperfect registration. In 18 out of 49 districts the birth-rate was less than the death-rate. The death-rate was 31·11, leaving an excess of births over deaths at 5·82 per 1,000. But as in the case of births, so here also there are indications of under registration, as the mean ratio is made up of district ratios varying from 55·42 to 21·86. Moreover, this ratio is below the average of the previous five years, namely 33·29. In 32 of the 49 districts of this province the ratio of the year was below the average of the preceding quinquennium. Most of the districts of the Rohilkhand, Meerut, Rae Bareli, Fyzabad, and Benares divisions were conspicuous in recording ratios below their quinquennial averages. The death-rate in towns (34·62) was higher than that in rural circles (30·85). All the chief causes of mortality, with the exception of fevers, gave rise to greater mortality than in the preceding year.

The registered birth-rate for the Punjab was 40·28 against 37·32 in the previous year. This ratio is evidence of good work, and must be very near the truth; but that some improvement is still possible is shown by the large variation in the maximum and minimum district ratios, which were 52·66 and 15·00 respectively. There was an excess of births over deaths in 24 of the 31 districts of the province. The death-rate was 32·00 against 30·0 in the preceding year, and 31 the average of the previous five years. All these ratios are probably considerably under the truth. The variation in the district ratios was between 42·0 and 17·0. In 20 of the 31 districts of the province the ratio of the year was greater than their quinquennial averages. In the Delhi and Jullundur divisions most districts recorded ratios below the quinquennial mean. In Gujranwalla, Jhelum, and Rawal Pindi the mortality was unusually high, owing, it is said, to the great prevalence of fevers in these districts, and particularly in the last quarter of the year. The rural death-rate was considerably smaller than the urban,

the respective ratios being 31·0 and 37·0 per 1,000. Fevers gave rise to a higher death-rate, but the other chief diseases to a lower.

In the Central Provinces the birth-rate was 39·30 against 41·52. The range of variation in district ratios was not great, namely, between a maximum of 47·69 to a minimum of 31·76 per 1,000. In only five districts of 20 were the births in excess of the deaths, and must probably be attributed to the unusual unhealthiness of the year. The excess of the provincial death-rate over the birth-rate was 4·49 per 1,000. The death-rate was 43·79 against 28·70, and 31·23 the average of the preceding five years, but allowance should be made for the increase in population since the last census was taken nine years ago. The district rates varied from 60·08 to 32·73. In every single district of the province the ratio of the year exceeded the quinquennial averages, and, with the exception of five districts, the deaths everywhere outnumbered the births. In this province the rural and urban death-rates were almost identical, namely 43·82 and 43·47 respectively. All the chief causes of mortality, especially cholera and fevers, gave rise to higher ratios than in the previous year.

The birth-rate of Berar was 39·6 against 41·3 in the previous year. The diminution was probably due, as in the case of the Central Provinces, to the unhealthiness of the year. The district ratios varied from 45·6 to 36·6 per 1,000. The deaths exceeded the births by 2·9 per 1,000. The death-rate was 42·5 against 24·7 in the preceding year, and 33·0 the average of the preceding five years. The district ratios varied from 49·3 to 37·0. As in the Central Provinces every district recorded ratios above the quinquennial average. The rural mortality was somewhat greater than the urban, the ratios being 42·8 and 40·7 respectively. Cholera, fevers, and bowel complaints gave rise to many more deaths than in the previous year.

Registration is still very imperfect in Lower Burma, especially in rural circles. The birth-rate was 21·15 against 23·91, the district ratios varying from 31·93 to 11·00. The registered birth-rate exceeded the death-rate by 4 per 1,000. The death-rate was 17·07, obviously much under-stated, against 23·40 in the preceding year, and 18·79 the past quinquennial average. The district ratios varied between 28·34 and 10·37 per 1,000. In five only of the 16 districts of this province were the ratios higher than the five-year averages, and as these are all under-stated, this is evidence of careless registration. Whilst the rural death-rate was stated to be 14·78, the urban ratio was set down at 34·28. Small-pox and injuries only gave rise to higher ratios than in the previous year. There was a very marked reduction in the death-rate from cholera.

The births registered in Assam were somewhat fewer than in the year before, the ratio being 31·20 against 31·62 in 1888. The district ratios varied from 39·86 to 21·63, and the births for the province exceeded the deaths by 0·50 per 1,000. The death-rate was 30·70 against 27·98 in 1888, and 27·51 the mean of the previous five years. The district ratios varied from 37·65 to 24·46 per 1,000. In seven of the nine districts of this province the ratio recorded exceeded the quinquennial averages. The rural mortality was 30·49, whilst the urban was 40·03. An increase occurred under all heads of mortality as compared with the ratios of the preceding year, and this increase, with the exception of that against cholera, probably indicates improvement in registration, though there is still ample room for further improvement.

In Madras Presidency the birth-rate recorded was 30·9 against 29·9 in 1888. There was large variation between the highest and lowest district ratios, namely, between 42·2 and 18·1 per 1,000. The births exceeded the deaths registered by 7·4 per 1,000. The death-rate was 23·5 against 21·4, and 21·5 the mean of the preceding five years. The district ratios varied from 42·6 to 15·6. In 14 of 22 districts the ratios exceeded the quinquennial means. Whilst the rural mortality was 23·2, the urban was 28·0. Cholera, small-pox, and fevers all gave rise to higher ratios than in 1888.

The birth-rate in Bombay Presidency was recorded as 36·49 against 38·57, and the district ratios varied from 50·53 to 19·71 per 1,000. The birth-rate exceeded the death-rate by 4·98 per 1,000. The death-rate was 31·51 against 28·44 in the previous year, and 26·58 the mean of the preceding five years. The variation in the district ratios is represented by the maximum ratio 45·19, and the minimum 15·75 per 1,000. In 21 of the 24 districts of the Presidency the ratios of the year exceeded the quinquennial averages. The rural mortality was 31·30, and the urban 33·12 per 1,000. Cholera was less fatal than in the preceding year, but small-pox, fevers, and bowel complaints gave rise to more numerous deaths.

The birth-rate recorded in Coorg was 16·36 against 16·61 in the previous year. These ratios are obviously much under-stated; but registration here is performed under peculiar difficulties. The death-rate was recorded at 22·92 or 6·56 per 1,000 in excess of birth-rate. The death-rate in 1888 was 19·41, and 18·16 the mean of the previous five years. In death registration therefore some progress was made. The urban and rural ratios were nearly alike, being 22·94 for the latter, and 22·32 for the former.

History of Chief Diseases.

Cholera.

The total number of deaths registered from cholera throughout India was considerably greater than it was in the preceding year, namely, 428,923 against 270,408. The distribution of these deaths among the various provinces is set forth in the following table, from which it will be seen that all provinces, with the exception of the Punjab, Bombay, Hyderabad, and Lower Burma, contributed to the increased total mortality :—

Annual Deaths from Cholera in India, 1877 *to* 1889.

Province.	Population.	Deaths from Cholera.											
		1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Bengal*	66,163,884	155,305	95,192	136,363	39,643	79,180	182,352	90,439	134,421	173,767	118,368	172,578	111,391	171,103
Assam	4,526,959	11,377	6,732	17,415	2,803	5,010	21,055	14,908	22,276	7,753	20,188	7,941	9,693	18,288
North-Western Provinces and Oudh.	44,107,869	31,770	22,221	35,892	71,546	25,865	89,372	18,160	30,143	63,457	34,565	200,628	18,704	48,494
Punjab	18,842,264	29	215	26,135	274	5,207	39	190	614	1,936	12	8,804	14,938	2,83
Central Provinces	8,817,185	3,418	40,985	27,575	330	9,140	11,932	16,235	149	21,868	16,679	12,576	921	52,5
Berar	2,620,573	842	34,306	223	1	3,404	3,573	27,897	87	3,683	976	14,396	305	10,925
Rajputana	†	60	2,393	918	—	197	1,327	797	1,297	1,695	173	2,612	32	6,923
Central India	†	926	8,047	2,734	299	581	1,562	1,740	1,018	4,624	290	8,868	191	3,344
Bombay	16,454,414	57,228	46,743	6,937	684	16,694	7,904	37,954	13,804	37,287	167	25,711	36,500‖	32,431
Hyderabad	†	7,414	6,696	6	—	1,721	150	1,947	2,479	1,387	499	2,831	2,057	1,128
Madras	27,907,840‡	357,430	47,167	13,296	613	9,446	23,604	36,284	75,476	58,109	12,417	28,359	58,677	76,020
Mysore	4,092,648	2,902	723	14	25	25	893	124	330	2,677	10	832	1,015	1,590
Coorg	178,302	§	49	—	—	3	31	—	—	—	—	3	2	9
Lower Burma	3,653,629	7,276	6,759	1,828	2,638	5,239	7,177	2,185	5,515	7,685	4,027	2,649	15,982	3,242

* Excluding Calcutta. † Population not known. ‡ Excluding Europeans and Eurasians.
§ Statistics not available. ‖ Including four deaths, the monthly distribution of which is not known.

The increase was especially pronounced in the Central Provinces, Berar, Rajputana, and Central India; but the total deaths in Bengal, Assam, North-Western Provinces, and Oudh, were also considerably greater than in the previous year. The total number of deaths recorded in the Central Provinces and Rajputana were greater than in any previous year since 1887, inclusive.

The seasonal prevalence of the disease in the several provinces is shown in the following table:—

Statement showing the Deaths from Cholera registered in the different Provinces by months, during the year 1889.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population.	
														1889.	1888.
Bengal	5,909	4,646	18,429	33,003	22,729	23,971	19,137	14,654	7,563	5,060	5,821	10,181	171,103	2·59	1·68
Assam	482	752	3,634	6,040	2,828	2,169	837	377	200	258	244	467	18,288	4·04	2·14
North-Western Provinces and Oudh.	24	39	932	4,769	7,695	8,107	4,750	8,855	6,922	8,196	2,595	610	48,494	1·09	0·42
Punjab	1	1	1	4	178	415	450	952	751	61	23	1	2,838	0·15	0·79
Central Provinces	—	30	159	931	8,387	14,407	13,983	11,128	2,651	817	91	4	52,588	5·96	0·10
Berar	14	256	675	1,243	1,208	1,094	2,507	2,978	750	132	57	11	10,925	4·2	0·1
Lower Burma	187	166	357	663	633	303	179	68	64	150	253	219	3,242	0·89	4·37
Madras Presidency	10,547	5,064	3,727	5,724	8,036	11,632	13,184	7,548	2,394	1,656	2,218	4,290	76,020	2·7	2·1
Bombay Presidency	496	227	895	2,952	6,163	5,202	6,379	5,042	2,500	1,686	375	514	32,431	1·97	2·22
Mysore	142	133	93	43	15	257	200	136	185	107	147	132	1,590	0·39	0·25
Coorg	9	—	—	—	—	—	—	—	—	—	—	—	9	0·05	0·01
Total	17,311	11,314	28,902	55,372	57,872	62,557	61,606	51,738	23,980	18,123	11,824	16,429	417,528		

In March the number of deaths reported rose rapidly and continued to increase up to June. Thereafter it fell gradually to November, but in December increased again. The month of minimum mortality was February.

In the following table data are given to enable an estimate to be made of the severity of the incidence of the disease in the several provinces :—

Province.	Mortality in 1889.	Mean Mortality of previous Five Years.	Urban Mortality.	Rural Mortality.	Per cent. of Villages attacked.	Maximum Mortality in Rural Circles.	Maximum Mortality in Towns.	Month of Maximum Prevalence.
Bengal - -	2·59	2·12	3·61	2·56	11·3	20·93	23·76	April.
Assam - -	4·04	2·91	5·18	4·01	19·0	8·69	34·02	April.
North-Western Provinces and Oudh.	1·09	1·57	1·07	1·10	6·3	14·10	27·32	August.
Punjab - -	0·15	0·28	0·41	0·13	0·95	1·14	2·92	August.
Central Provinces -	5·96	1·18	5·99	5·96	15·1	14·14	50·89	June.
Berar - -	4·2	1·4	4·4	4·1	14·6	11·0	18·0	August.
Lower Burma -	0·89	1·96	2·37	0·69	8·3	5·84	16·33	April.
Madras - -	2·7	1·6	4·2	2·6	17·2	14·0	23·2	July.
Bombay - -	1·97	1·38	1·79	2·00	11·5	5·92	24·41	July.

It will be observed that the mortality per 1,000 of population was greater than the previous quinquennial mean in all provinces but North-Western Provinces and Oudh, and Punjab, the excess being most marked in Assam, Central Provinces, and Berar. With regard to the incidence of the disease in rural, as compared with urban, circles, it will be seen that urban circles suffer more, as a rule, this difference being especially well marked in the Madras Presidency. In Bengal, North-Western Provinces and Oudh, and Bombay, the rural mortality exceeded the urban, especially in the first named. With reference to the diffusion of the disease over the provinces, the percentages of villages returning deaths afford information. Judged from these data the disease was most diffused in Assam, Madras, Central Provinces, and Berar. The maximum mortality recorded in any single rural district of provinces was 20·93 in Bengal, and the maximum in any town was 50·89 in the Central Provinces.

In Bengal the disease was more fatal than in the previous year, having given rise to a death-rate of 2·59 per 1,000 against 1·68 in 1888, and 2·12 the mean of the previous five years. The percentage of villages attacked was 11·3, against 8·31 in the preceding year. The highest district ratio recorded was 20·93 per 1,000, and the highest town ratio 23·76. No district escaped altogether from attack, but those which suffered most were Poori, Balasore, Cuttack, Purneah, and Backergunge. The mortality ratios for the several divisions were as follows :—

	Ratio per 1,000.		
	1889.	1888.	1884–88.
Burdwan - - - -	1·79	1·27	1·54
Presidency - - -	2·45	2·60	2·78
Rajshahye - - - -	0·64	0·78	1·55
Dacca - - - -	3·05	2·06	2·61
Chittagong - - - -	1·76	1·31	1·40
Bhagalpur - - - -	3·41	1·04	1·47
Patna - - - - -	1·26	1·92	2·27
Orissa - - - -	12·82	2·15	4·28
Chota Nagpur - - -	1·99	1·88	1·41

The increased death-rate of the year, as compared with the preceding year, was therefore contributed to by all divisions except the Presidency, Rajshahye, and Patna; but the increase contributed by the Burdwan, Chittagong, and Chota Nagpur was not great. The brunt of the increase was borne by the Orissa division, where the death-rate was about six times as great as it was in the previous year, and three times greater than the previous quinquennial average. Next to Orissa the Bhagalpur division contributed most to raising the provincial ratio.

The number of European seamen who arrived in the Port of Calcutta fell from 22,705 in the previous year to 20,662. The daily average population was, however, 1,626, against 1,510 in the previous year. The total death-rate among these sailors was 31·36 per 1,000 against 37·74 in the preceding year, 11·07 of which was due to cholera. The total number of casualties among them was 51 against 57 in 1888. No admissions into hospital were made for small-pox or scurvy. The Native floating population of the port was estimated at 25,630. The number of deaths reported was 129, or 5·03 per 1,000, against 5·77 in 1888. The Sanitary Commissioner notes that the figures would appear to show that both the European and Native populations of the river enjoyed better health during the year under report than in 1888.

Cholera was very prevalent in Assam, having given rise to nearly twice as many deaths as in 1888. The death-rate per 1,000 was 4·04 against 2·14 in the previous year, and 2·91 the mean of the previous five years. It prevailed with more or less intensity in all districts and throughout the year. Deaths were recorded in 19·0 per cent. of villages, and while the highest mortality recorded in any rural circle was 8·69 per 1,000, it was 34·02 among towns. In the Surma Valley the disease showed signs of renewed activity towards the latter end of 1888, and after reaching its highest intensity in April declined up to September. But in October deaths increased again in frequency. In the Brahmaputra Valley a few sporadic cases occurred during January and February, but thereafter the disease became epidemic in all districts, reaching its highest intensity in June. Thereafter it declined gradually to its lowest point in November, but in December it began to rage again with virulence, especially in the Nowgong district.

The total number of coolies going to Assam was 37,548 or 4,231 more than in the preceding year, equivalent to an excess of 12·6 per cent. In addition there were 18,110 children or 5,134 more than in 1888, equivalent to an increase of 39·5 per cent. The total number of immigrants, therefore, including children, was 55,658, an increase of 9,365 over the number of the previous year, and equivalent to 20·2 per cent. Of the grand total 19,096 (an increase of 23·56 per cent.) went to the Surma Valley, and 36,562 (an increase of 18·55 per cent.) to the Assam Valley. The coolies to both valleys suffered much from cholera, which was very prevalent not only in the recruiting grounds whence they came, but also throughout the Bengal districts, through which they had to pass. In the province of Bengal the majority of coolies pass through Manbhum and Raniganj. The death-rate from cholera in Purulia (the town in the district of Manbhum) was 19·45 per 1,000, and in the town of Raniganj 12·52. Of the total number of arrivals at Dhubri, 3,122, against 322 in 1888, came by steamer *viâ* Goalundo, the rest having come by the railway route *viâ* Kaunia and Jatrapur. The total number of coolies despatched from Dhubri to the several labour districts was 33,872, of whom 111 died on board the steamers *en route*, the deaths being due chiefly to cholera. Besides these, 1,763 immigrants were shipped at Goalundo for gardens in the Assam Valley. These last do not land at Dhubri, but are inspected by the civil surgeon. Cholera was very prevalent, especially in the month of March, when a serious outbreak took place. The most disastrous voyage was that of the steamer "Brahman," which left Dhubri with 243 immigrants on the 12th March. Twelve deaths occurred from cholera between Dhubri and Gauhati, and four at Tezpur, where all the coolies were landed, and further casualties were prevented by the prompt action of the Deputy Commissioner. On this subject the Deputy Commissioner, Darrang, reports:—

"I had the steamer taken to a *char* opposite Tezpur, on which a cholera-shed had been built, landed all the coolies, 198 in number, and had new huts erected for their accommodation. I also had provisions and medical comforts put on shore. The cholera was of a most virulent type. Seventy-six persons were attacked on the 15th, of whom 16 died; on the 16th, 13 new cases occurred, and the deaths on this day amounted to 21; on the 17th, there were six new cases and 12 deaths; on the 18th, four new cases and eight deaths; on the 20th, one new case and four deaths; and on the 21st, no new cases, and only one death."

Eventually the survivors who were fit to travel (113 coolies) were forwarded in a special steamer, special notifications being sent to the places at which the coolies had to be landed. The facts of this lamentable case were fully inquired into at the time by Sir Dennis Fitzpatrick.

The total casualties on the journey within the province were as follows:—

	Number of Deaths.		
	From Cholera.	From other causes.	Total, 1889.
At Dhubri	135	17	152
On board the steamers	90	21	111
At ports of debarkation—			
Gauhati	—	—	—
Tezpur	96	1	97
Silghat	9	2	11
Kokilamukh	21	7	28
Disangmukh	9	9	18
Nigriting	8	—	8
Mohanamukh	6	—	6
Total	374	57	431
Total for 1888	771	67	838

The number of deaths at Dhubri and on board the steamers was much smaller than during the previous year, while no deaths are said to have occurred at Gauhati against 148 deaths in 1888.

With regard to the coolies who proceeded to the Surma Valley we have not such accurate information, as very few of them make use of the depôts, the majority marching straight to the gardens. From the figures supplied by garden managers it appears that 19,096 came to the valley. A daily steamer service is now established, and about 56 per cent. of the coolies take advantage of it.

The mortality amongst immigrants during transit to Sylhet and Cachar cannot be stated, as only a few immigrants passed through the depôts, and way-bills are not prescribed in the case of free immigrants. The following figures, given by the Deputy Commissioners of Sylhet and Cachar, refer only to coolies who passed through the depôts:—

District.	Year.	Number of Immigrants who left Goalundo.	Deaths.			
			En Route.	In Hospital.	Total.	Proportion per 1,000.
Cachar	1889	3,316	124	72	196	59·1
	1888	3,246	99	40	139	42·8
Sylhet	1889	4,414	59	—	59	13·3
	1888	2,537	21	9	30	11·8

The number of deaths recorded from cholera in North-Western Provinces and Oudh considerably exceeded those of the previous year, namely, 48,494 in 1889 against 18,704 in 1888, or a ratio of 1·09 per 1,000 against 0·42 in 1888, and 1·57 the mean of the previous five years. The percentage of villages recording deaths was 6·3 against 2·26 in the previous year. The districts which suffered most were Kumaon, Lalitpur, Tarai, Bareilly, Moradabad, Aligarh, Agra, Azamgarh, Ghazipur, and Ballia. In 15 of the 49 districts of the province the ratios of deaths exceeded the previous quinquennial means. In all the districts of the Lucknow, Allahabad, Rae Bareli, and Fyzabad (15 in all), the mortality ratios were under, and often considerably under, the past quinquennial averages. During January and February only a few sporadic fatal cases were recorded, but in March the disease began to make rapid progress, reaching a high point in May. Thereafter it subsided considerably during June; but in July its virulence gained in force, and in August the highest number of deaths was recorded. And now the disease proved very fatal until during November it fell rapidly, and in December comparatively few deaths were recorded. The rural mortality was 1·10 and the urban 1·07, and while the maximum recorded mortality in any town was 27·32, it was 14·10 in any single district.

In the Punjab the number of deaths recorded was considerably fewer than in the previous year, namely, 2,838 against 14,938, the corresponding ratios per 1,000 being

0·15 and 0·79. From the fact that deaths were recorded in only 0·98 per cent. of villages, it is evident that the disease was not widely diffused over the province. In fact the ravages of the disease were confined to the Southern, Eastern, and some few Central districts, all of which in the preceding year enjoyed either complete immunity from the disease or escaped with only a few sporadic cases. The Sanitary Commissioner writes :—"As the Rewari tahsil of the Gurgaon district borders with the Alwar "State, and as there is a direct road between Alwar and Rewari, travellers going "and coming between the two places daily, I am of opinion that in all probability "the disease was carried from Alwar to Rewari, even though, on going to the "spot in May to inquire into the outbreak, I was not able to prove that the "first reported case had come into contact with a recent arrival from Alwar." The districts which suffered most were Rohtak, Simla, Hoshiarpur, and Jullundur. Sporadic cases occurred in the earlier months of the year, and it was not until May, as is generally the case in this province, that the disease assumed epidemic proportions. It died out at the end of the year.

As already noted, the Central Provinces suffered very severely from cholera, after a year of comparative immunity. The total number of deaths recorded was 52,588 against 921 in the previous year. This large number was the highest recorded since 1877 inclusive, representing a ratio of 5·96 per 1,000 of population against 1·18, the mean of the preceding five years. During January not a single death from cholera was recorded in any district. In February it broke out epidemically in Nagpur and Wardha. It then began to spread to other districts during the two succeeding months, but it was not until May that it became general, and no district escaped. The largest number of deaths from it was recorded in June and July; after that it declined, and by the end of November it had almost died out. In December only four cases were reported throughout the province—at Sambalpur. The districts which suffered most were Chanda, Bilaspur, and Sambalpur. It is somewhat remarkable that, although the disease prevailed with a degree of severity unprecedented since 1874, only 15·1 per cent. of villages reported deaths. The Sanitary Commissioner writes :—"Many "Civil Surgeons refer the origin of the disorder to importation by human intercourse "from places said to be suffering from cholera; but to its almost simultaneous "appearance in many centres in a district there is no satisfactory explanation given, "nor is the strange exemption of certain areas environed by cholera considered and "discussed." The Civil Surgeon of Bhandara notes that the areas of the greatest intensity of the disease, and on which it first showed itself in 1889, correspond with the records of previous epidemics, pointing to the local conditions which favoured the development and spread of the disorder.

In Berar also cholera raged with virulence, also after a year of unusual immunity. The total number of deaths was 10,925 against 305 in 1888, corresponding with ratios of 4·2 and 0·1 per 1,000 respectively. More than one-third of the total deaths from this cause occurred in the district of Basim alone, and the district which suffered least was Buldana. The outbreak commenced in January with sporadic cases in Amraoti, Wun, and Akola, and began to prevail epidemically from February, reaching its greatest intensity in August, and dying out towards the end of the year. But, notwithstanding this increased prevalence of the disease, only 14·6 per cent. of villages recorded deaths against 23·4 in 1887, a year also of epidemic prevalence.

In the Bombay Presidency the deaths recorded from cholera were fewer than in the previous year, namely, 32,431 against 36,500; but it is to be borne in mind that 1888 was a year of unusual prevalence; and the diminished number of deaths in the year under report did not serve to reduce the ratio of deaths below the quinquennial average. The ratio was 1·97 against 2·22 in 1888, and 1·38 the quinquennial average. The percentage of villages recording deaths was 11·5 against 12·74 in the preceding year. The disease was present in the Presidency throughout the year, and not a single district escaped altogether. The districts of the Sind division, however, with the exception of Karachi, suffered less than those of the other divisions. The months of the greatest prevalence were May to August. Towards the end of the year the disease declined all over the Presidency, but it was then at its height, in Karachi. Bijapur, Sholapur, and Nasik were the most severely visited districts.

In Madras Presidency the deaths recorded rose from 58,677 to 76,020, or from a ratio of 2·1 per 1,000 to 2·7, the past quinquennial average being 1·6. This mortality was greater than it had been in any year since 1877. In this Presidency there was a striking difference between the urban and rural mortality ratios, the former having

been 4·2 and the latter 2·6. The percentage of villages recording deaths was 17·2 against 11·15 in the preceding year. The disease was prevalent in all districts throughout the year. The disease showed signs of renewed vitality at the close of the preceding year, and in January of the year under report the deaths numbered over 10,000. During the two following months there was a marked and gradual abatement in its intensity, but in April there was a recrudescence, and deaths increased from month to month until it reached a maximum in July. Thereafter it declined until October, when, as usual, it gained in force again. The district which suffered most was Ganjam, where the death-rate was 14·2 per 1,000; but curiously enough only 16 per cent. of villages recorded deaths against 17·2 for the whole Presidency.

Deaths from cholera in Lower Burma were much fewer than in the previous year, namely, 3,242 against 15,982, corresponding with ratios of 0·89 and 4·37 per 1,000. But the year 1888 was one of great epidemic prevalence. The past quinquennial average was 1·96. The percentage of villages recording deaths was 8·3. The disease was not epidemic in the Arakan division, only three deaths having being reported from the Akyab district, and these at long intervals from one another. The bulk of the mortality occurred in the Irrawaddy and Tenasserim divisions. The period of highest intensity was April and May instead of July and August as in 1888.

Almost all the Rajputana States were visited by cholera. The disease first appeared in April and did not finally disappear until October. The one British district, Ajmere, also suffered, but not severely. From returns submitted it appears that there were in all 13,952 cases with 6,923 deaths, or 49 per cent. of cases. June and July were the worst months as regards mortality, while the disease was most widespread in July and August. In several instances medical officers state their opinion that the disease had been imported by pilgrims or travellers. The evil influence of the massing of large numbers of people, with no precautionary sanitary arrangements, was strikingly shown by the outbreak at the Kaila Devi Fair in Kerowli, and the spread of the disease in Kota following the large attendance at the former at the funeral feast of the late Maharaja.

In the following paragraphs a resumé is given of the reports made by medical officers on outbreaks under their charges, under the usual headings:—

Effects of fatigue.—Among the European troops 30 communities were attacked, the most severe being at Neemuch, were 22 cases occurred (including 5 Native camp followers); at Meean Meer, where 14 cases occurred (including 4 Natives); and at Secunderabad, where 13 cases occurred. In the case of 13 attacked communities only a single case occurred; in 24 cases 5 or fewer men were attacked. Among Native troops 50 communities were attacked, the most severe being at Bellary, where 46 cases occurred in the 14th Madras Infantry (including 23 followers); again another community at the same place among the 20th Madras Infantry and depôt of the 13th Madras Infantry, where 21 cases occurred (including 15 followers); and at Hingoli among the 1st Cavalry, where 21 cases occurred. In 19 attacked communities only a single case occurred, and in 40 five or fewer. Among jails 54 communities were attacked (including two lunatic asylums), the most severe being at Allahabad, where 84 cases occurred; at Moulmein, 55 cases; at Ungool, 41 cases; at Cuttack, 19 cases; at Dacca, 18 cases; at Mymensingh, Telikhal, and Buxar, 17 cases each; and at Tavoy, 16 cases. In 17 attacked communities a single case occurred, and in 32 five or fewer. With reference to histories of antecedent fatigue or exposure attending the first cases, nothing unusual was reported. As in former years excessive indulgence in food and drink, unusual fatigue with or without unfavourable climatic conditions, are noted. Among European troops in six instances the first men attacked were in hospital undergoing treatment for other diseases (inflammation of glands in groin, enteric fever, tuberculosis, rheumatism, acute dysentery, and ague and debility). Among prisoners 5 such instances occurred—2 in men being treated for dysentery, 2 for ordinary diarrhœa, and 1 for abscess.

Prevalence of diarrhœa before or during outbreaks.—Among European troops diarrhœa was reported to have been prevalent in 5 communities, slightly prevalent in 6, and not prevalent in 19. The 5 communities in which the disease was prevalent were in Nowgong, where 3 cholera cases occurred; in Neemuch, with 22 cholera cases; in Kamptee, with 9 cases; on river steamer at Mandalay, 7 cases; in Secunderabad, 13 cases. Among Native troops diarrhœa was prevalent in 4 communities, slightly prevalent in 9, and not prevalent in 37. The communities in which diarrhœa was prevalent were stationed at Shillong, where 5 cholera cases occurred; in Sirur, where there were 4 cases; in Ellichpur, with 1 case; and in Hingoli, with 21 cases. Among the jails,

diarrhœa was reported to be prevalent in 18 communities, slightly prevalent in 15, and absent in 21. Diarrhœa was especially prevalent in the Presidency jail, where 10 cases of cholera occurred; in the Moulvi Bazár lock-up, 3 cases; in the Lahore Central jail, 1 case; and in Maubin, 12 cases.

Proportion of buildings furnishing cases.—For European troops we have full data in the case of 18 communities. Among these of 349 buildings occupied, 48 furnished cases, or 13·7 per cent. against 16·2 per cent. in the previous year. For Native troops we have particulars in the case of 43 communities. These occupied 16,680 huts, and cases came from 158 or 0·94 per cent. against 2·3 per cent. in the previous year. For Jails the details are given for 49 communities. These occupied 732 buildings, and from 167 of these cases came, or 22·8 per cent. against 39·76 per cent. in the previous year. The high proportion in jails requires no other explanation than that given in former reports. In combining all these data we find that 110 communities occupied 17,761 buildings, and 373 of these furnished cases, or 2·1 per cent. against 8·8 per cent. in the preceding year. This total result is, however, obviously of little practical significance.

Meteorological conditions.—There is nothing of particular interest to notice under this head. All varieties of season are noted as usual.

Any communication between the first case and any case in the bazar or elsewhere.—As usual the information afforded on this subject is indefinite. For European troops it is, for example, noted that at Calcutta the disease is present all the year round, and that the first case could be traced to importation; but that no connexion could be discovered between this first case and those that occurred afterwards. Again, at Benares it is said that no importation of the disease into the barracks could be traced, neither could any connexion be established between the first and the subsequent cases. In the majority of cases medical officers reported simply that no connexion could be established. Among Native troops the same vague statements are made. Thus at Rajkote it is said that the first case was not imported, but that the subsequent three cases were no doubt due to infection from the first case, as the germs of the disease must have been hanging about the locality. Again, at Ellichpur it is stated that the first case was probably imported, as the woman had been to the bazar where the disease prevailed. Again, at Jalna the first two men attacked were members of a large party that had gone to the town of Old Jalna to partake of a wedding feast, and on their return both showed signs of illness the same night. At Old Jalna cholera was prevalent. At Secunderabad it is stated that four other cases occurred in the house in which the first came from. Among jails we have often more definite information, and the following are examples. At Hooghly it is stated that the first case was due to importation, as he was a newly admitted prisoner, and there was a good deal of cholera within the municipality: the first case was admitted into hospital two days before the attack of the second, and only other in the same enclosure. At the Arrariah Sub-jail it is said of the first and only case that he came from an attacked village, and that he occupied the same building with his brother who died of cholera two days before his admission. At Dacca it is reported that it would appear that the case was imported, for the jail was perfectly healthy until the arrival of the batch of prisoners on transfer from Tipperah: it is noteworthy that no other man of this party was attacked. At this jail there were in all 18 cases. At Patna it is stated that the first case was not imported; there appeared to be some connexion between the cases, as they all occurred in men who were connected with the *hajut* (under-trial) ward. In this jail there were three cases in all. It is worthy of note that in 36 of 54 communities attacked, no connexion could be traced. In 10 cases the first men attacked came from cholera-prevailing parts shortly afterwards attacked.

Attendants attacked.—For European troops we have full details in the case of 122 patients who were attended upon by 322 individuals, and of these latter 4 were attacked or 1·24 per cent. against 0·56 per cent. in the previous year. Of these 4 one was a dooly-bearer. In no single community was more than one attendant attacked. Among Native troops 544 attended 242 cases, and 13 of them were attacked, or 2·38 per cent. against 2·00 in the previous year. Of the attendants attacked two were sweepers and one the daughter of a sweeper. The number and ratio of attendants attacked was much raised by the occurrence of six cases at Bellary, where, as already mentioned, 46 cases occurred in one community alone. There were altogether 40 attendants on the 46 cases and the six attendants attacked represents a ratio of 15 per cent. It should be mentioned that the disease was severely epidemic in the region. For the jail population we have 568 attendants on 464 cases, and of the former 19 were attacked

or 3·34 per cent. against 4·00 per cent. in the previous year. Of the attendants attacked nine were sweepers. The largest number attacked in any one community was four (out of 22 attendants) at the district jail of Allahabad, where there were 84 cases in all, and one of these was a sweeper. In the following table these results are brought together:—

Communities.	Number of cases of Cholera treated.	Medical Officers, Hospital Assistants, and other Attendants on Cholera Cases.		Percentage of Attendants attacked.
		Number.	Number of these attacked.	
European troops	122	322	4	1·24
Native troops	242	544	13	2·38
Jails	464	568	19	3·34
Total	828	1,434	36	2·51

Comparing the totals with those of the previous year we find that they are all smaller with the exception of the percentage of the attendants attacked, which was 2·26 in the preceding year.

Sanitary defects.—At Dum-Dum the drainage is said to be imperfect owing to insufficient outfall. At Nowgong surface drainage was defective and barrack accommodation insufficient. At Sohagpur Rest-Camp (2nd Derbyshire Regiment) the drainage of the camp and its surroundings was reported to be defective; and it is stated that a foul gutter surrounded the edge of the masonry all round the well. On board the ship at Mandalay, the filter being out of order, the troops drank unfiltered river water for one day before and three days after the occurrence of the first case. The boat (*Pagan*) was overcrowded. At Secunderabad the surface drainage of the barracks was defective. Among the reports from Native troops we read of overcrowding at Shillong, Cawnpore; insufficient drainage at Cawnpore (since remedied), Bolaram, Secunderabad, Cuttack, Bellary; indifferent or deficient water at Vizianagram, Bellary, and Bangalore. Among jails the following sanitary defects were noted. Overcrowding at Alipore, Ooloobariah, Netrokona, Mangaldai, Cuttack, Ungool, Chandpur, Allahabad; bad ventilation at Presidency, Bhagalpur, Chandpur, Ludhiana; drainage defective at Burdwan, Mymensingh, Bhandara, Agra; defective water-supply at Netrokona, Cuttack, Lahore, Moulmein, Agra; defective conservancy arrangement in Netrokona, Bhandara.

Effect of movement into camp.—Among European troops 18 attacked communities moved into camp. In 14 of these no further case occurred after movement. In the case of two communities a single case occurred; in one, two other cases occurred, and in another three other cases after movement. At Neemuch, where 22 cases occurred, the community was broken up into 13 parties and moved into camp: in one only of these did other cases occur, and in that there were three. At Meean Meer, where 14 cases occurred, the community was broken up into six parties; in all but one no further cases occurred, and in that one two other cases occurred after the second move. At Secunderabad, where 13 cases occurred, the disease was at once stopped by movement.

In the case of Native troops 12 attacked communities moved. In six cases the disease was at once arrested; in four others a single case occurred after movement. In Bellary, where 46 cases occurred, the community was broken into two parties: the *first* had 38 more cases, and the second three.

Among attacked jail communities 16 moved. In eight of these no other case occurred. In Moulmein, where 54 cases occurred, the community was broken up into three parties; the *first* after the first move had 24 cases, and after the second move 12 cases; the *second* had 21 other cases; the *third* 10 more. At Allahabad, where there were 84 cases, a move was made, but 23 further cases occurred. At Ungool, where 41 cases occurred, the community moved; after the first move they had 12 cases, and after the second 22. At Dacca, where 18 cases occurred, the community was broken up into four parties; the first and fourth had no more cases; the second had one, and the third had two. At Mymensingh, where 17 cases occurred, three parties

were formed, and no other case occurred. At Cuttack, where 19 cases occurred, two parties were formed; one had four more cases, and the other three more. At Tavoy, where 16 cases occurred, a move was made, which at once arrested the further spread of the disease.

Small-pox. The increase in the number of deaths from this disease over that of the preceding year, which was noticed in the report for 1888, was followed unfortunately by a still further increase during the year under report. The total number of deaths was 130,624 against 93,556. This increase was contributed to by all provinces except the Punjab, Mysore, and Coorg. The ratio of deaths per 1,000 of population was in all the same provinces in excess of those of 1888, and in the following order :—Central Provinces, Burma, North-Western Provinces and Oudh, Berar, Bombay, Madras, Assam, and Bengal. In Assam the increased number of deaths was confined to the Surma Valley, or more particularly to the Sylhet District, and is attributed to the continued practice of inoculation.

Fevers. The number of deaths from fever was greater than in the previous year, having been 3,524,763 against 3,371,487.

Statement showing the Deaths from Fevers registered in the different Provinces, by months, during the year 1889.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population.	
														1889.	1888.
Bengal - -	92,861	69,848	72,588	97,264	70,285	62,670	88,312	83,148	96,734	114,036	114,238	139,537	1,101,521	16·72	16·53
Assam - - -	5,271	4,411	4,649	5,351	6,513	6,816	6,817	6,589	6,561	6,504	6,541	7,101	73,124	16·15	15·87
North - Western Provinces and Oudh.	85,365	62,599	60,606	73,122	77,870	77,921	70,284	88,429	97,205	114,921	109,297	101,309	1,018,928	23·10	23·89
Punjab - -	32,933	25,004	23,130	23,516	29,390	29,499	24,991	26,817	37,277	55,803	63,313	57,039	428,712	22·75	20·16
Central Provinces -	12,123	11,498	15,182	16,134	15,875	15,060	13,694	20,519	21,895	23,056	20,993	17,023	263,052	23·03	17·94
Berar - -	2,739	2,606	3,993	4,844	3,761	2,806	2,937	4,737	5,561	5,307	4,385	3,428	47,104	17·9	11·4
Lower Burma -	2,882	2,187	2,185	1,987	1,932	2,055	2,964	3,155	2,881	2,453	2,647	3,015	30,343	8·30	9·96
Madras Presidency	19,958	15,906	16,392	15,838	17,209	17,531	20,188	21,726	20,780	19,699	20,342	25,203	230,172	8·2	7·3
Bombay Presidency	26,967	22,901	27,849	30,482	27,983	25,167	29,134	32,670	30,380	32,766	32,350	28,329	346,878	21·08	18·50
Mysore - - -	3,285	2,736	3,273	3,421	3,023	3,120	3,466	3,425	3,433	3,628	4,191	4,654	41,656	10·18	9·19
Coorg - -	284	237	194	204	252	440	377	318	306	233	209	219	3,273	18·35	15·31
Total -	284,568	219,333	230,041	272,163	254,093	243,085	263,164	291,534	323,013	378,406	378,506	386,857	3,524,763		

All provinces, except North-Western Provinces and Oudh and Burma, contributed to the increase, but the provinces which contributed most were in order of highest contribution—Berar, Central Provinces, Coorg, Punjab, and Bombay.

The total deaths recorded by Bengal were 1,101,521, representing 16·72 per 1,000 of population against 16·53 in the previous year. Deaths occurred in all registering circles, and in 68·0 per cent. of all villages. The highest ratio was recorded in the Julpaiguri district and the lowest in the Poori. The month of maximum intensity was December and that of the least, June. The rural mortality exceeded the urban, the ratios being 10·84 for towns and 16·92 for districts. Fevers accounted for 68·9 per cent. of the total mortality from all causes.

The total number of deaths recorded in Assam were 73,124, representing a ratio of 16·15 against 15·87 in the preceding year. Deaths were recorded in 70·2 per cent. of villages. The district recording the highest mortality was Goalpara, and that the lowest the Khasi and Jaintia Hills, or omitting this, Lakhimpur. The month of maximum prevalence was December and of minimum prevalence, February. The urban mortality exceeded the rural, the ratio for the former being 19·87, and that for the latter, 16·07. Fevers gave rise to 52·6 per cent. of the mortality from all causes.

In the North-Western Provinces and Oudh 1,018,928 persons died of fever, or a ratio of 23·10 against 23·89 in the previous year. Deaths occurred in nearly all registering circles, and in 90 per cent. of villages. The highest district ratio was recorded in the Tarai and the lowest in Gorakhpur. The month of maximum prevalence was October and of minimum prevalence, March. The urban and rural ratios were

nearly alike, being 24·19 for towns and 23·02 for districts. Of deaths from all causes fevers caused 74·2 per cent.

In the Punjab the disease gave rise to 428,712 deaths, equal to a ratio of 22·75 against 20·16 in the previous year. Nearly all circles recorded deaths, and 88·1 per cent. of villages. The district which recorded the highest ratio was Jhelum and the lowest Simla, or excluding this Jhang. The month of maximum prevalence was November and of minimum prevalence March. The rural mortality in this province exceeded the urban, the ratios being 22·99 for the former, and 19·71 for the latter. Fevers accounted for 71·9 per cent. of the total mortality from all causes.

In the Central Provinces 203,052 deaths from fever were recorded, equivalent to 23·03 per 1,000 against 17·94 in 1888. All registering circles recorded deaths, and 81·9 per cent. of villages. The highest mortality was recorded in the Saugor District and the lowest in Sambalpur. The month of maximum prevalence was October and of minimum prevalence February. The urban mortality was 18·45 and the rural 23·46. Of the total deaths recorded in the province fevers gave rise to 52·6 per cent.

In Berar fevers gave rise to 47,104 deaths, or 17·9 per 1,000 against 11·4 in the preceding year. All circles recorded deaths, and 62·9 per cent. of villages. The district which suffered most was Wun, and that which suffered least Buldana. September was the month of maximum prevalence, and February the month of least prevalence. Whilst the urban mortality was 16·4, the rural death-rate was 18·2. Of the total number of deaths recorded from all causes fevers caused 42·2 per cent.

The total number of fever deaths registered in Lower Burma was 30,343, equivalent to 8·30 against 9·96 in 1888. About 88 per cent. of the circles recorded deaths, and 69·6 per cent. of villages. The district which suffered most heavily was Sandoway, whilst the smallest district ratio was noted against Thongwa. August was the month of maximum prevalence and May the minimum. The urban mortality exceeded the district; the former ratio being 10·96, and the latter 7·95. Of the total deaths recorded in the province from all causes fevers gave rise to 48·6 per cent.

In the Madras Presidency fevers gave rise to 230,172 deaths or 8·2 per 1,000 against 7·3 in 1888. Deaths from this cause occurred in all circles, and in 53·4 per cent. of villages. The highest district mortality was shown in Kurnool and the lowest in Tanjore. The disease was most fatal in December and least so in February. The urban death-rate was 5·5 and the rural 8·3 per 1,000. Fevers occasioned 34·8 per cent. of the mortality from all causes.

In the Bombay Presidency 346,878 deaths were caused by fevers, equivalent to 21·08 per 1,000 against 18·50 in the previous year. Deaths occurred in all circles, and in 93·5 per cent. of villages. Broach suffered the most severely of all districts, and the City of Bombay the least. The largest number of deaths was recorded in October and the smallest number in February. The rural mortality was higher than the urban, namely, 21·84 against 16·04 per 1,000. Of the total deaths recorded from all causes fevers gave rise to 66·9 per cent.

Bowel complaints.

The number of recorded deaths from bowel complaints rose from 251,144 in 1888 to 273,427. All provinces, except Punjab, Lower Burma, and Mysore, exhibited an increased death-rate. The increase in the ratio of Berar was most pronounced; but, as has been pointed out in previous reports, this province is characterised by great fluctuations in the mortality, not only from bowel complaints, but also from cholera.

Injuries.

The number of lives lost from injuries rose from 85·793 in the preceding year to 91,473. In most provinces the ratios for the year under review are greater than those for the year before, but in Berar and the Madras Presidency the ratios of the two years were identical, and only in Mysore it was somewhat smaller.

All other causes.

The number of deaths recorded in the several provinces from all causes other than those above referred to was 1,085,192 being greater than that of the previous year by 79,847. Thus under all the separate heads above considered the number of deaths recorded was greater than the total number of the preceding year.

Vaccination.

The highest number of vaccinations performed, irrespective of the population and area of the province, was recorded in Bengal, followed by Bombay and the

Punjab. The highest average number of operations performed by each vaccinator was 3,146 in the Punjab, and the lowest 704 in Assam. The highest percentage of success attained in primary vaccinations was 99·36 in Bengal and the lowest 86·10 in Burma, whilst in re-vaccinations the highest percentage of success was 84·34 in Coorg, or, excluding this, 83·17 in Assam, and the lowest 26·84 in Berar. The cost of each successful operation varied between 5 annas and 4 pies in Bombay to 1 anna and 6 pies in Bengal. As regards the ratio of successful vaccinations per 1,000 of population, the highest are recorded against Punjab 40·13 and Coorg 45·39, whilst the lowest against Assam 24·43, and North-Western Provinces with Oudh 16·09. With regard, lastly, to the percentage of annual estimated births (40 per 1,000) successfully vaccinated the highest proportion is recorded in Berar 78·3, and the lowest in Coorg 11·0, Burma 11·1, Bengal 12·3, and Madras 14·3.

The average number of vaccinators employed in Bengal was 2,278 against 2,320 in the preceding year. These vaccinated 1,703,288 persons against 1,758,354, each vaccinator having performed on an average 748 operations against 758. In the above operations success was obtained in primary cases at 99·36 and in re-vaccinations at 32·68 per cent. The dispensary establishments vaccinated in addition 102,182 against 87,815 in the previous year, with success in primary cases at the rate of 95·72, and in re-vaccinations 64·85 per cent. Each successful case cost 1 anna 6 pies, the same as in the preceding year. The proportion of population protected was 28·79 per 1,000 against 29·51 ; and the percentage of estimated births protected was 12·3 against 11·5 in the previous year.

The average number of vaccinators employed in the North-Western Provinces and Oudh rose from 677 in the previous year to 700, and the total number vaccinated from 764,190 to 800,757. Whilst the average number vaccinated by each vaccinator was 1,128 in the previous year, it was 1,144 in the year under review. The percentage of success attained in primary operations was 93·27, and in re-vaccinations 65·00. The total number of re-vaccinations performed was considerably less than in the previous year, viz., 14,800 against 21,050. The average cost of each successful vaccination was 2 annas 11 pies against 3 annas 1 pie in the year before. The proportion of population protected during the year was 16·09 per 1,000 against 15·14 in the previous year. The percentage of infants born, estimated at 40 per 1,000 of population, who were successfully vaccinated, was 18·4 against 17·9.

The total average number of operators employed in the Punjab was 294 against 285 in the previous year, and the total number vaccinated was 924,814 against 931,142, and each vaccinator performed on an average 3,146 operations against 3,267. The proportion of success obtained by the special vaccination establishment in primary operations was 95·76, and in re-vaccinations 50·63. The dispensary establishment vaccinated 3,867 persons against 5,542 in the preceding year, with success in primary operations at 92·12 per cent. and in re-vaccinations at 43·20. The cost of each successful operation was 1 anna and 7 pies, the same as in the previous year. The ratio of successful vaccinations performed per 1,000 of population was 40·13 against 40·84 in the previous year. Of the estimated births 63·9 per cent. were protected.

The average number of vaccinators employed in the special establishment of the Central Provinces was 237 against 247 in the preceding year. These vaccinated 396,584 persons against 434,935, with success in primary operations at the rate of 96·26 per cent. and in re-vaccinations at 82·00. Each vaccinator performed on an average 1,659 operations against 1,734 in the previous year. The dispensary establishment vaccinated 14,692 persons against 14,792, with success in primary cases and re-vaccinations at 92·96, and 69·29 per cent. respectively. The cost of each successful case was 2 annas and $1\frac{1}{4}$ pies against 1 anna and 11 pies in the preceding year. The ratio of population protected was 34·87 per 1,000 against 37·51 in the previous year, and the estimated births protected was 47·4 per cent. against 46·8.

The total average number of vaccinators employed on the special establishment in Berar was 42, the same number as in the previous year. Each man on an average vaccinated 2,234 against 2,288. The total number vaccinated by them was 93,851 against 96,100, with success at the rate of 95·79 per cent. in primary cases and 26·84 in re-vaccinations. The dispensary establishment vaccinated 8,346 against 9,144, with success in 95·7 per cent. of primary cases and 36·3 in re-vaccinations. The cost of each successful case was 3 annas and 1 pie against 2 annas and 11 pies. The proportion of population protected was 35·40 per 1,000 against 36·6, and the percentage of estimated births protected was 78·3 against 79·4 in the preceding year.

The special vaccination establishment in Lower Burma consisted on an average of 60 men against 56 in the preceding year. Each vaccinator on an average performed 2,009 operations against 1,659, and the total number vaccinated was 120,552 against 92,914. The success attained by them was 86·10 per cent. in primary cases and 69·73 in re-vaccinations. In addition to these the dispensary establishment vaccinated 4,400 persons against 4,187 with 63·33 per cent. of success in primary cases and 58·17 per cent. in re-vaccinations. The cost of each successful vaccination was 4 annas and 7 pies against 6 annas in the preceding year. The proportion of population protected during the year was 26·67 per 1,000 against 19·79, and the percentage of estimated births protected was 11·1 against 10·0 in the previous year.

The average number of vaccinators employed in Assam was 185 against 197 in the preceding year, and each vaccinator performed on an average 704 operations against 629. The total number vaccinated by them was 130,238 against 123,880, with success in primary cases at 92·59 per cent. and in re-vaccinations 83·17. The dispensary establishment moreover vaccinated 7,265 persons against 4,479, with success in primary operations at 93·37 and in re-vaccinations at 81·39. The cost of each successful vaccination was 2 annas and $1\frac{3}{4}$ pies against 2 annas and $3\frac{2}{3}$ pies in the previous year. The proportion of population protected was 24·49 per 1,000 against 25·38, and the estimated births were protected to the extent of 8·3 per cent. against 11·1 in the previous year.

The average number of vaccinators employed in Madras Presidency was 793 against 797 in the previous year, and each vaccinator performed on an average 1,069 operations against 986. The total number vaccinated by them was 847,899 against 790,590, with success in primary cases at 95·6 per cent. and in re-vaccinations at 76·2. The dispensary establishment added 27,849 operations against 18,827, of which 86·9 per cent. were successful in primary cases and 58·9 in re-vaccinations. The cost of each successful case was 3 annas and 11 pies against 4 annas and 2 pies. The proportion of the population protected was 26·1 per 1,000 against 24·4, and the percentage of estimated births protected was 14·3 per cent. against 13·3 in the preceding year.

The average number of vaccinators employed in Bombay Presidency was 509 against 496 in the previous year. Each man on an average performed 1,857 operations against 1,883 in the year before. The total number vaccinated was 945,614 against 933,990. The ratio of success in primary cases was 94·95 per cent. and in re-vaccinations 61·64. The dispensary establishment vaccinated 5,859 against 7,077, with success in primary cases at 87·61 per cent. and in re-vaccinations at 59·21. The cost of each successful operation was 5 annas and 4 pies against 5 annas in the preceding year. The ratio of successful vaccinations per 1,000 of population was 34·34 against 34·07, and the percentage of annual estimated births successfully vaccinated was 58·1 against 58·0.

Ten vaccinators were employed in Coorg as in the previous year, and each on an average performed 875 operations against 714. The total number of vaccinations performed was 8,747 against 7,145. In these cases primary operations were successful in 93·76 per cent. and re-vaccinations in 84·34 per cent. The dispensary establishment vaccinated 215 persons against 51 only in the previous year, with success at 86·69 per cent. in primary cases and 58·33 in re-vaccinations. The proportion of population protected was 45·39 per 1,000 against 37·60 in the previous year, and the percentage of estimated births protected was 11·0 against 8·5.

Sanitary Works, Military.

The total expenditure incurred in 1889–90 on military works, executed for the health and comfort of troops in India, amounted to Rs. 60,74,202. This exceeded the amount expended on similar works in 1888–89 by no less than Rs. 4,60,840.

Civil Sanitary Works.

A good deal was spent by the district boards of Bengal in carrying out improvements in the interior of districts. The municipalities spent in all Rs. 12,81,031 on sanitary works, or, including construction and maintenance of roads, Rs. 17,20,740 against Rs. 11,30,081 and Rs. 15,83,996 respectively in 1888. Private charity also contributed towards the improvement of sources of water-supply and carrying out some other sanitary works for the benefit of the public in many of the districts. The works executed during the year consisted, as usual, of the construction of culverts,

drains, roads, latrines, urinals, &c., and excavation or clearing of tanks, wells, canals, &c.

The most important sanitary works in hand in the North-Western Provinces and Oudh during the year were the waterworks of Agra, Allahabad, and Benares. Sewage schemes also occupied the attention of the Local Government. A project for supplying Cawnpore with pure water was under preparation. In most of the other municipalities more or less expenditure was incurred on conservancy and some minor sanitary improvements, such as construction or repair of culverts, drains, wells, latrines, &c., &c.

The following are some of the sanitary works executed or undertaken in the Punjab during the year: The Delhi waterworks and conservancy tramway were in hand. The construction of drainage channels for the towns of Jullundur and Ludhiana was in progress. At Gujranwala, Rs. 44,559 were spent on works connected with the extra-mural drainage of the town and an outfall channel. At Rawal Pindi a main for the distribution of water from the new waterworks to a part of the city has been constructed. The waterworks at Peshawar are approaching completion. At Mooltan, Rs. 11,560 were expended in constructing masonry drains and cleaning and repairing wells. At Amritsar an extra-mural drainage channel was completed at a cost of Rs. 7,217, and part of the city ditch was filled up at a cost of Rs. 10,211. Schemes for the water-supply of several other cities were also under preparation or consideration. On the whole, Rs. 9,83,370 were expended by the different municipalities on conservancy, roads and streets, bridges, drainage, sewerage, water-supply, and latrines. In regard to village sanitation very little progress has yet been made. The Deputy Commissioner of Sialkot has appointed sweepers in the larger village of his district, which the Sanitary Commissioner found, on inspection, to be decidedly cleaner than villages with no sweepers in them. The proposals of the committee appointed to consider the question of establishing a provincial sanitary board for the Punjab are still under consideration.

The only work of any magnitude undertaken in the Central Provinces during the year was the extension of the water supply of Nagpur city to the suburb of Sitabaldi and some other parts of the town. The waterworks at Burhanpur were being remodelled by the Public Works Department at the cost of the municipality. Projects for the water-supply of Harda, Khandwa, and Raipur, were under consideration. Minor improvements were carried out in almost all the larger towns of the province. The expenditure incurred in the 19 head-quarter towns on conservancy, drainage, waterworks, buildings, vaccination, and miscellaneous improvements, amounted to Rs. 1,83,048. In all 218 new wells were constructed and 235 old ones were repaired. Rules under the Village Sanitation Act were being revised in view of their introduction into those larger and more flourishing villages where the means of the inhabitants will permit of the raising of sufficient funds for local improvements. With regard to smaller villages rules have been already issued under the Central Provinces Land Revenue Act, and it is expected that elementary reforms will be gradually carried out in them. Under instructions from the local administration the Sanitary Commissioner has succeeded in improving considerably the sanitary condition of several municipal towns by advising the municipal authorities on the subject, in conjunction with the Deputy Commissioners of the different districts. The Chief Commissioner has already established a Sanitary Board with the Deputy Surgeon-General and Superintending Engineer as members; and these officers have been ordered to prepare a plan of operations for a general sanitary survey of all municipalities.

The only sanitary works of importance executed in Berar during the year were the extension of the Amraoti City waterworks at a cost of Rs. 30,000, and the construction of concrete drains in the town of Murtazapur at a cost of Rs. 16,493. In addition to these, Rs. 25,304 were spent by the Public Works Department on minor sanitary works during the year. The expenditure incurred by the municipalities on conservancy, drainage, water-supply, and other sanitary improvements was Rs. 91,529. Besides this, Rs. 1,02,213 were expended during the year in carrying out the conservancy arrangements and sanitary improvements in the civil stations, villages, and non-municipal towns of the province. The sanitary survey of towns and villages which was taken up in 1888 is still in hand. Here, instead of a Provincial Sanitary Board ordered by the Home Department, district and village boards have been established and instructions have been issued for their guidance. A record is being

prepared, showing the condition of the water-supply of all places in the province at which large annual fairs are held, and the measures considered necessary for the removal of the defects.

Systematic action was being taken in Assam to improve the sanitary condition of towns and villages. With regard to towns and *hâts* (periodical markets) full instructions have been issued to district officers, and detailed schemes have been drawn up, which will be carried out as funds become available. In the case of rural areas also, a beginning has been made in consultation with the Provincial Sanitary Board, and grants-in-aid have been distributed to such local boards as needed them. In all, Rs. 98,681, or about 55·96 per cent. of total income was spent by the different municipalities, unions, &c., on works conducive to public health and comfort.

In Lower Burma, upwards of 13 lakhs was spent during the year on the new drainage and high-pressure water-supply system for Rangoon. The construction of a tramway for conservancy purposes at Bassein was in progress. The Village Act of 1889 was being enforced throughout Lower Burma, and arrangements were being made to take up the sanitary survey of the municipalities as soon as an engineer was appointed for the purpose. In all, Rs. 74,859 was spent by the Public Works Department throughout Lower Burma on water-supply, drainage, latrines, markets, and burial grounds. Besides these, the municipalities of the province also spent a considerable amount of their income on various minor improvements, and on conservancy, and other items of an annually recurring nature.

In Upper Burma Rs. 66,022 was expended in 1889 by the Public Works Department on water supply, drainage, latrines, urinals, markets, burial grounds, and scavenging.

There is not much to record under the head of sanitary improvement in Madras Presidency. Omitting the town of Madras, the municipalities of the Presidency allotted Rs. 6,57,328 for sanitary improvements during 1889–90; but of this only Rs. 4,25,620 were spent by the end of December 1889. Besides this, projects for the water-supply and drainage of various towns were either sanctioned or were under preparation or consideration, but it was only in the case of Cuddapah that considerable progress was made during the year to bring the scheme of water-supply to completion. Now that a Sanitary Board has been established in the Presidency, the Local Government hopes that various schemes which could not hitherto be undertaken for want of professional assistance will be taken in hand. In rural circles the only sanitary undertakings of any magnitude in hand were the drainage and conservancy schemes for the town of Nandyal, in Kurnool. The other works carried out during the year consisted chiefly in improvements to water-supply and village sites, and in the construction and repair of dust-bins, latrines, drains, markets, slaughter-houses, &c. In all, out of Rs. 5,63,332 allotted by the Local Fund Boards for the sanitary improvement of rural tracts during 1889–90, only Rs. 3,09,808 were spent in the first nine months, ending with December 1889. But the Local Government has already taken steps for ensuring the more extensive utilisation of the funds available for carrying out sanitary improvements in villages and small towns.

In all the municipalities of Bombay a portion of their income was expended on conservancy arrangements; but it has been pointed out by the Sanitary Commissioner that in many of them greater attention was paid to the cleaning of roads than to the removal of nightsoil and sullage from houses. The new sanitary works executed during the year seem to have been very few and unimportant. In some of them only new wells were sunk, latrines and urinals were constructed, and drains, gutters, or culverts were provided. A scheme was in hand for improving the Sudder Bazar drainage of Poona, and the new waterworks at Ahmedabad were progressing slowly.

No sanitary work of any magnitude was undertaken or executed during the year in Coorg. The municipalities and the Public Works Department combined spent in all Rs. 4,114 on petty sanitary improvements, against Rs. 3,159 in 1888. The conservancy of villages and non-municipal towns, and the improvement of the water-supply of outlying towns, were under the consideration of the local authorities in conjunction with the Provincial Sanitary Board, and some progress in these respects was expected.

General Remarks.

Camaran.

Dr. Ata Muhammad, Vice-Consul at Jeddah, has submitted a full and interesting report on the Lazaret at Camaran for the pilgrim season of 1889. During the year

29 ships and one small sailing boat with 18,754 pilgrims called at Camaran to undergo quarantine, and of these 12,476 were arrivals from Indian ports. The quarantine imposed varied from 5 to 10 days. There were 39 deaths (0·21 per cent.) amongst the pilgrims during their stay in quarantine from various non-infectious diseases as well as from old age and debility. Of the deaths 24 occurred among Indians and 15 among Malays. The causes of death were fevers (12), old age and debility (9), bowel complaints (9), chest affections (7), small-pox (1), and cachexia (1). There was not a single case of cholera amongst the pilgrims at Camaran throughout the season, nor did any vessel have any case of the disease amongst passengers or crew during the voyage to Camaran. The arrangements made for the distribution of water to pilgrims on their first arrival appear to be unsatisfactory, and they suffered much inconvenience on that account, although the amount of water available in the wells is sufficient. Many of the huts and latrines were said to be in bad repair. Cholera did not break out in the Haj of 1889 in Mecca or any other place along the route of pilgrims.

Cholera in Mecca and Jeddah.

After a complete immunity from the disease since 1883 cholera broke out among the Haj pilgrims in 1890. Details regarding this outbreak are not yet available, but the following information has been furnished in advance by Dr. Abdur Razzak, Vice-Consul at Jeddah. From the day of the first appearance of cholera in Muna up to the 20th August, the total mortality amongst the inhabitants and pilgrims in Mecca and Jeddah was about 3,806. This, taking into account the number of pilgrims who arrived by sea, namely, 43,496, and the population of the two towns above mentioned, represents a very small percentage. On the 21st August the Vice-Consul reported that 14,000 pilgrims had already departed, and that no fresh cases were occurring. On the 15th September he again wrote that since the 21st August there had been a slight recrudescence of the disease in Jeddah between the 24th and 28th August, after which it gradually decreased. From the 2nd to the 12th September no deaths from cholera had occurred. In Mecca cholera had altogether ceased after the 21st August; but in Yembo it showed some signs of activity for four days from the 28th to the 31st August, chiefly among pilgrims. No further news had been received in the Consulate from the latter place after the 31st August.

Special inquiry into kála-azár and beri-beri.

Surgeon G. M. Giles, M.B., was deputed on special duty to inquire into the nature and causation of kála-azár and beri-beri, diseases which had recently come into prominence in Assam. A full account of his results will be published shortly; but he has submitted an interesting preliminary note, which forms an appendix to the annual Sanitary Report of the province of Assam for the year 1889, and which is here reproduced.

"Kála-azár is the name given by the Natives of Assam to a peculiar malady which has of late years invaded the province. I use the term 'invaded' loosely, because it is impossible to pronounce with certainty whether the disease has been introduced from without, or whether it may have existed for a long time amongst the remoter corners of the hills.

"However that may be, it is only during the last few years that the disease has become so common as to attract notice in the more settled parts of the country.

"As by far the more urgent matter, the investigation of this disease was first taken in hand. I found on inquiry that Gauhati would be the best place to take as a base of operations. Though not as yet very rife, there are plenty of cases to be met with amongst the townfolk of Gauhati itself, and, within a few miles' ride, there are numbers of villages where the disease is to be met with in its most virulent form.

"The word kála-ázár means 'black fever,' and I was accordingly, at the outset, somewhat surprised to find that the malady, far from being one of an acute character, is a slow and wasting disease.

"Briefly, the most prominent symptoms described by the Natives are progressively increasing, wasting and weakness, with occasional, though rarely severe, attacks of 'fever,' enlargement of the spleen, darkening of the complexion, and at the end various dropsical affections.

"Proceeding to the examination of actual cases, I found that the one universal symptom common to all was extreme anæmia, and with it necessarily the weakness and wasting so much complained of. As to fever, I found that the histories given by patients varied greatly. Some thought that their illness commenced with fever, but had had it only at first; others had been troubled with slight feverish attacks throughout; others again had had no fever at first, but had suffered from attacks lately.

"Amongst such cases as I have been able to induce to remain a few days under observation in hospital (mostly very advanced cases), I found that the most noticeable

thermometric sympton was a persistently sub-normal temperature, often remaining for long periods below 95° F.

" Some showed occasional elevations to the normal, or even as high as 100° F., but in no case did the course of the temperature for any length of time present any markedly malarial characteristics.

" Remembering, too, how apt Natives are to describe any and every indisposition as 'fever," it will at once be seen that there can be no necessary connexion between fever and kála-azár in the sense that we are accustomed to use the former word.

" The same remark applies with even greater force to enlargement of the spleen. To past medical histories, as described by ignorant and unobservant people, interpretations of the most varied character may be attached, but the presence or absence of enlargement of the spleen is a matter about which there can be no doubt, and its absence in even a single case will at once disprove any necessary casual connexion between the two conditions. Speaking roughly, I should say that some two-thirds of the kála-azár cases met with about the Kamrup district will be found to present more or less splenic enlargement, but in the remaining third it will not be appreciable by physical diagnosis, and in the most rapidly fatal case that I have had the opportunity of examining post-mortem there was no splenic enlargement whatever. Now, the Kamrup district is so extremely malarious that, whether otherwise healthy or otherwise sick, by far the greater proportion of the population will be found to exhibit a greater or lesser amount of enlargement of the spleen. I have no doubt that a nearly equal proportion of enlarged spleens would be found amongst the victims of a small-pox or cholera epidemic, should such occur in this district. Any necessary connexion between kála-azár and splenic enlargement must therefore be relinquished, and it must, when present, be looked upon as merely an accidental complication.

" With respect to the darkening of the complexion, about which so much has been said, I can offer no personal opinion, as I have necessarily been unable to observe any individual case from beginning to end. The average duration of a case of kála-azár extends over many months, and the utmost period during which I have had any individual case under observation has been about a month. All the European medical officers I have consulted are entirely sceptical as to the existence of any such change, and, in a country where complexions vary so greatly as they do in Assam, its diagnostic value, even if bronzing be a fact, must be absolutely nil, as it will very rarely happen that the physician can have any previous acquaintance with his patient. I am inclined to think that a deceptive appearance of pigmentation is actually present, but is due, not to any essential change in the skin, but is caused partly by the leaden tint always found in anæmia, however caused, and partly by the circumstance that, during sickness, even cleanly Natives habitually neglect their persons, and that the accumulated dirt and dried epithelium make the skin appear much darker than it used to be during health when properly attended to.

" We are thus confronted with the fact that the one constantly present, and ever most prominent sympton of kála-azár, is anæmia. The cause of this symptom remains to be seen.

" For some time I was in the dark as to its causation. Bacteriological examination of the blood yielded absolutely negative results, and there was nothing to account for the pernicious anæmia and the extreme depression of the vital powers of the patients.

" The first post-mortem examination, however, showed that there were present in the small intestines a number of the well-known and fatal parasite *dochmius duodenalis*, better known as the *anchylostoma*. The cause of the anæmia in this case was therefore obvious, and, without occupying unnecessary space, I may at once state that I have been able to make out undoubted evidence of the presence of this parasite in every case of kála-azár that I have been able to submit to detailed examination, and not only so, but I have found that wherever kála-azár is prevalent in a village, I have been able to find the ova and embryonic forms of the parasite scattered broadcast in its soil and puddles. It will be readily seen how thoroughly this explanation solves all the difficulties that have surrounded this hitherto obscure disease. Using the term in its broad sense of communicability, there is no disease that can fairly be said to be more infectious than *anchylostomiasis*, always assuming the absence of proper measures of conservancy and the co-existence of suitable climatic conditions. That these conditions are most efficiently present in Assam is already abundantly shown by the terrible mortality which, under the name of beri-beri, the same disease has caused amongst the labourers on the tea gardens.

" That the disease does not, as a rule, spread as rapidly and fatally amongst them as in Assamese villages is readily explicable by the circumstance that, on the gardens

a certain amount of supervision is exercised over the coolies, and that some, it is true very half-hearted, attempts at sanitary improvement are instituted. Moreover, hundreds of cases that would go to swell the mortality of a village, are, in the gardens, saved by the timely administration of thymol.

" Speaking of thymol, it may also be of interest to note that our experience with this drug in the treatment of kála-azár is in all respects the same as that of the medical men who are engaged in the treatment of the beri-beri of coolies. All that I have consulted with, I find, are somewhat disappointed of the great anticipations they had been led to form for this drug. Of its efficiency as a vermifuge there can be no doubt.

" *Anchylostoma, ascarides*, tape-worms, and flukes are all expelled with the same unfailing certainty, but in *anchylostomiasis*, unless the case be taken very early, experience shows that the mere expulsion of the worms is not sufficient. Their presence has brought the patient to such a condition that he can no longer digest the rude forms of nourishment alone available, and hence the anæmia continues, and finally carries off the patient from want of the assimilable nourishment that can alone repair the losses that have been inflicted by the worms during their residence in the intestine. Both Dr. Mullane and myself have treated considerable numbers of kála-azár patients with thymol; but as most of our cases have been in extremis, the drug, though entirely successful in expelling the worms, fails to save life in, by far, the greater number of cases.

" From a consideration of the above facts, only one conclusion can be drawn, and that is, that the prime agent in causation of kála-azár is this most fatal of all entozoa, the *anchylostoma.* Of course every case that will be shown one in a village as 'kála-azár' is not of this nature. As is quite natural, any and every case of wasting disease will be attributed to it, and, besides a considerable number of cases of simple enlargement of the spleen, I have had produced before me cases of phthisis, morbus cordis, caries of the spine, and lardaceous disease from prolonged suppuration as undoubted instances of kála-azár. While studying kála-azár at Gauhati, I made some experiments on the development and history of the parasite, but the necessity of frequent excursions into the district, &c. unavoidably caused such observations to be of a very desultory character; and, though I am inclined to hope that I see some light in this direction, the full working out of the, at present, very obscure question of the life history of this parasite must be a matter of future continuous observation, and it would be premature here to allude to new points which I can only now say that I suspect. After thus satisfying myself as to the causation of kála-azár, I started off on a tour of inspection among the tea gardens, visiting the Lakhimpur, Sibsagar, and Darrang districts. * * * As I spent a week in Dhubri, examining the incoming coolies, and established the fact that some 2½ per cent. of the new comers are already victims of *anchylostomiasis*. I have also, as requested by you, paid a visit to Barpeta, on the insanitary condition of which, should you desire it, I can furnish a special note.

" Whatever be the complete life history of the *anchylostoma*, one fact is absolutely certain, and that is, that the eggs of the entozoic stage of the worm are contained in, and spread abroad with, the *dejecta* of patients harbouring the parasite. Whatever be the stages that the worms pass through after deposition, the spread of the disease is an obvious impossibility as long as the *dejecta* containing the ova are so disposed of that the worms, when hatched out, cannot gain admission to the human intestinal canal. Given efficient conservancy, and the disease is powerless to spread, however bad other conditions of sanitation may be. Without some attempts at conservancy, no system of sanitation, however complicated or well arranged, can be of any great use in combating this particular disease. So far as they have gone, my observations tend to show that drinking water, though perhaps an occasional carrier, is by no means the most common vehicle of infection, and I feel sure that the question of conservancy must somehow be faced, and that it is neither more nor less than an alternative of conservancy or death for the population of the affected districts.

" I am well aware that the introduction of measures of conservancy in villages teems with practical difficulties, but the experience of small municipalities in other parts of India is so far encouraging that, as is well known, the Governments of Bombay and of the Central Provinces are even now seriously taking up the question of village sanitation, and I understand that a beginning has been made in Assam. I may here, too, mention an encouraging fact that I have come across on my travels, which tends to show that even a little conservancy will go very far in the prevention of the disease. I find that *anchylostomiasis* has never spread seriously amongst the labourers at the coal mines. Coolies suffering from the disease have again and again been met with, and treated, but the disease has never spread; and this, although the life of the miner

offers such great facilities for the propagation of the parasite, that in Europe it is only among such populations that the disease has been met with. It is noteworthy that it was here alone that I found the least attempt to carry out measures of conservancy. All that is done is, that the coolie lines and the interior of the mines and their neighbourhoods are kept clean by a regularly paid staff of sweepers, and that by no means a large one; and the very large measure of success that has attended such a simple proceeding as this leads me to hope that no measures of any very elaborate character will be required.

"It now only remains to mention what is left to be done. We can never be in a position to speak with absolute definitiveness about the prevention of this disease until we are absolutely certain of all the details of the life history of the worm, and it is to this question that I propose to mainly devote myself. In addition to this, the minute examination of the pathological material already collected remains to be done, and, with reference to the question of transmission by drinking water, I propose to examine as large a series of specimens of drinking-water from the affected districts as may be obtainable."

Cholera in Bussorah and Baghdad.

The following interesting report on an outbreak of cholera in the Wilaiats of Bussorah and Baghdad was submitted by Brigade-Surgeon R. Bowman of the Bombay Medical Service:—

"Before touching upon the late epidemic, it may be interesting to give a slight sketch of previous appearances of this disease in these two provinces of the Ottoman Empire. Sir Henry Rawlinson, then Consul at Baghdad, writes on the 30th September 1846 as follows:—

"'Cholera, which has lately been devastating Persia, appeared in Baghdad on or about the 18th September. For a short period it continued to show itself in a very mild form, the number of daily cases not exceeding 40 or 50, and a very small proportion of these cases terminating fatally; latterly, however, it has acquired much greater strength, and, although fully one-half the inhabitants have quitted the city, deaths from the malady during the past week have averaged at least 100 per diem.'

"On the 14th October 1846 he reports:—

"'Cholera at Baghdad has carried off at the lowest estimate 5,000 persons.'

"Also that the force of the pestilence has now sensibly abated. Again, on the 28th October:—

"'Cholera has quitted the immediate vicinity of Baghdad; the number of deaths in the town of Baghdad itself have exceeded 6,000.'

"(Ending thus):—

"'I fully expect that the mortality of the Pashalik (exclusive of Bussorah) will be found during the last forty days to reach an aggregate of at least 30,000 souls.'

"1847. Sir A. Kemball, then acting Consul at Baghdad, on the 15th September, reports the re-appearance of cholera in a milder form, stating the number of fatal cases reported as not exceeding 10 to 12 persons daily. Major Rawlinson in his final report, 27th January 1848—

"'The population of Baghdad may be roughly estimated at 80,000 souls. In the year 1846 out of 20,000 cases of cholera in Baghdad, at least 6,000 proved fatal. In 1847 out of 1,000 cases there were 150 deaths. In the year 1846 the disease first showed itself at Baghdad on September the 18th, and the last case, I believe, occurred on 28th October, the epidemic having thus lasted for forty days.'

"In 1847 the first case occurred on 10th September and the last on 15th October, the duration of the malady being reduced to a period of 35 days; during both years the disorder was at its height for about a fortnight, in one visitation the number of deaths during that interval averaging 200 per diem, while in the other the daily loss was about 10. From the Consular records, Baghdad was not visited by cholera until the 9th December 1860, when the epidemic lasted to the 2nd January 1861; 64 deaths occurred during this period.

"The disease did not appear again until the 28th September 1861, when Dr. Hyslop reports that up to the 9th October the number of fatal cases were seven per diem. From the 9th October to the 6th November the death-rate was counted as eight per day; the total number of deaths during this period of 39 days being about 302.

"After the 6th November 1861 there has been no epidemic of cholera until this year 1889, and I cannot discover even the mention of a single case among my medical records during a period of nearly 28 years.

"*First appearance of the disease at Shatra.*—On the 3rd August the following letter was received from the Baghdad Government by Colonel Tweedie:—

"'The VIth Corps d'Armée and Bussorah Wilaiat report that cholera has broken out in Shatra district and town of Naseriyeh in the Muntafik country.'

"Shatra district is in longitude 44° and latitude 31° 32'.

"The Shattu'l Hai, a canal between the Rivers Euphrates and Tigris, runs through it; it is low-lying, and is usually inundated during the spring rises of both rivers, but the inundation gradually dries up as the rivers fall.

"From the 25th July to the 16th August 347 deaths have been returned by the Sanitary Department as due to cholera.

"On the 2nd August the epidemic appeared at the town of Naseriyeh on the left bank of the Euphrates, built about 20 years ago by Nasir Pasha, the then Sheikh of the Muntafik tribe; population about 3,000; up to the 26th August 470 deaths were returned. Thence to the village of Suku'-sh-Shuyuk (market-place or town of the Sheikhs) on the Euphrates, and near where the Shattu'l Hai enters it; population about 1,500; deaths recorded 101. Thence to Hamar, also on the Euphrates.

"On the 6th August cholera was first reported from Bussorah with a population of about 12,000, where the epidemic is said to have been very severe; from 6th August to 27th October 465 deaths were returned.

"I append a list of places where the disease appeared with the mortality (as received and prepared from the bulletins issued by the Baghdad Sanitary Office); but here I must note that I do not consider these returns to be complete, owing to the following reasons which the people had for evading the sanitary regulations: 1st, their objection to being put under surveillance; 2nd, to being put into quarantine; 3rd, the high burial fees; 4th, the fear of many of the poorer classes of having their clothing and bedding burnt, should the doctor in attendance, in accordance with instructions issued by the Municipal authorities, inform them of the presence of cholera; and in some such cases I am aware of persons dying from the disease without applying for medical aid:—

"*Total mortality from Cholera, with names of places.*

Afetch	-	96	Fao	-	4	Kizrabad	-	10	Shatra	-	347
Ali Garbi	-	40	Hai	-	5	Koufa	-	3	Shinafiyah	-	39
Altin Keupri	-	3	Hamer	-	6	Kourna	-	3	Shkhiyer	-	9
Amara	-	198	Hillah with Hawas		128	Kubeissa	-	41	Samawa	-	110
Baghdad	-	934	Hindiyah	-	16	Kút	-	3	Suku-sh-Shyukh	-	101
Bakuba	-	15	Hit	-	1	Mandali	-	116	Sulahiyah	-	143
Bedaa	-	15	Hor and Duhn	-	78	Medjir Kebir	-	217	Suleimaniah	-	219
Bedra	-	3	Howedir	-	12	Medjir Saghair	-	10	Tourradji	-	8
Bincoundra	-	35	Imam Moadhin	-	26	Midadiah	-	3	Tour Hourmat	-	7
Bussorah	-	469	Iskendirich near Mosul	-	7	Mosul	-	153	Taouk	-	8
Divaniyah	-	4	Kadhimain	-	294	Musseyib	-	34	Tchihala	-	337
Divaniyah (tribes around)	-	400	Kara Bey	-	1	Najaf	-	80	Um Barour	-	7
Djchara	-	325	Karbala	-	424	Naseriyeh	-	470	Yeniyeh	-	5
Djessan	-	6	Kirkuk	-	528	Ravenduz	-	70	Zerbatia	-	7
Djerboua	-	11	Khanakin	-	103	Ramadi	-	2			
Erbil	-	176	Khoi Sandjak	-	16	Shahraban	-	5	TOTAL	-	7,327
						Shamiyah	-	381			

"*Probability of local origin.*—The character of the country where the disease first broke out appears to me to be very favourable for the generation of cholera (*sui generis*), and though it would be most difficult to prove its local origin, still there are facts against the disease having been introduced from India, viz. the distance by sea from Karachi, the nearest Indian port on an average at least a twelve days' voyage by the ordinary steamers; then twenty-four hours under observation at the quarantine station below Bussorah; the distance from Bussorah by river to Shatra; the non-appearance of cholera at the port or town of Bussorah until the 6th August, 13 days from the time it was first notified as at Shatra, and the absence of cholera in any other part of the province at the time. Also, as touching upon this point, I may mention before the official notification of the appearance of disease (the word used in Turkish being khastalik), I had been informed of a disease proving rapidly fatal in many cases which from the descriptions I thought a severe form of remittent fever, and it was not until after the arrival of Monsieur Lubicz at Shatra (the Chief Sanitary Inspector of both provinces) that the disease was officially recognised as cholera.

"Many eminent authorities, I am aware, are of opinion that cholera is a disease only imported from the Gangetic Valley of India; however, in the Shatra district, or it might be called valley, the same conditions exist excepting a sparser population. In conclusion, the absence of cholera for so many years from the two provinces (though this may be used as a strong argument for its importation); but I beg to point out that there is no evidence to prove the existence of cholera within many hundred miles of the Shatra district at the time of its first appearance there.

"*First appearance and progress of the disease at Baghdad.*—Baghdad city, latitude 33° 20′, longitude 44° 29′, with a population now of at least 100,000 inhabitants.

"On the 13th August I was informed that about 7 P.M., the evening before, a Christian servant of Mr. Naom Lucca, a resident of Bussorah, but living at Baghdad for almost two months, had been attacked with cholera and died after a few hours' illness; however, no reports were received from the Sanitary Department until the 16th, when four deaths from cholera were returned. The mortality rapidly rose until the 25th August, when 93 deaths were recorded. From that date until the 30th September, when the disease as an epidemic terminated, the mortality slowly declined. The total number of deaths up to the 1st October was 927; a few cases were reported from time to time until the 28th November, when the official returns were discontinued.

"The total mortality, according to the quarantine bulletins, being 934. As mentioned before, I am inclined to think these figures considerably below the actual mortality, and consider the total number of deaths close upon, if not over, 1,600. To this ought to be added the deaths at Imam Azam or Moadhim, a suburb of Baghdad, to the north, but where the disease only existed for a short time, viz. from the 29th August to the 12th September, the number of deaths returned were 26.

"As reported at the time, there was a universal panic among all classes of the people of Baghdad and a general exodus of the population resulted; at least one-half of the residents went into camps a few miles distant from the town, in consequence of which I only attended alone 28 cases, of which number seven proved fatal, though I saw many others in consultation with the Turkish doctors and Dr. Sutton. I have attempted to get an approximate number of persons attacked, but am unable to do so, as the various accounts differ so vastly.

"The escort of Her Majesty's 21st Regiment, Bombay Native Infantry, numbering 26 men, escaped, although the disease was on all sides of their quarters. The Residency establishment, a numerous body when families are included, only suffered in the persons of Mr. DeMello (the head clerk), his wife and child, but all made perfect recoveries.

"On the 21st of August the Officer Commanding I. G. S. "Comet" landed a member of his crew suffering from a mild attack of cholera, and next day, after receiving permission from Colonel Tweedie, C.S.I., and the Sanitary Department, moved up the river for a distance of about 10 miles above Baghdad. I detained the man for twenty days after recovery, and then sent him back to the "Comet." I understand no other case occurred on board.

"*Shiah shrines.—Kadhimain*, a town about 3 miles from Baghdad, with a population of 13,000. Cholera first was reported on the 23rd August and terminated on the 21st October; the total number of deaths returned were 294. The unsanitary condition of this town is beyond description, being one of the worst in the province, and it is astonishing to find such a low mortality; but for reasons given before many deaths were not reported.

"*Karbala* or *Mashad Husain*, one of the most sacred of the Shiah shrines, contains the tombs of Husain, son of Ali, and that of Abbas his half-brother; is a place of pilgrimage for large numbers of Indian, Persian, and other Shiahs; also thousands of bodies from every country where the Shiah faith exists are brought here for interment, so that the place is one vast burial ground. The population is estimated at between 50 and 60,000; it is distant from Kadhimain about 50 miles. The first case of cholera appeared on the 31st August, reached its height on the 10th September, when 38 deaths were reported; it gradually declined, and on the 29th September was supposed to have ended. However, on the 21st October it re-appeared, but finally ceased on the 28th October. The official returns give the total number of deaths as 424. When at Karbala last month I was informed the second outbreak was chiefly among a large party of pilgrims said to have just arrived from Kadhimain; it may be only a coincidence, the re-appearance at Karbala and the disappearance at Kadhimain of the disease on the 21st October. The chief priests of the shrines told me they did not consider the total mortality could have been above 650.

"*Najaf* or *Mashad Ali.*—Another most sacred shrine of the Shiah faith, the burial place of Ali: a wall town rising out of the desert, slighly elevated above the surrounding plain; also a most popular burial place of members of the Shiah branch of the Muslim religion, as indicated by the thousands of tombs on three sides of the walls, and containing about 15,000 inhabitants. On my arrival here late in November I was somewhat surprised to hear the official returns were almost correct; the Chief Mujtehed only increasing the Turkish returns by five.

"The disease commenced on the 7th September and ended on the 18th, the official return showing only 80 deaths. The immunity enjoyed by the inhabitants of Najaf may be accounted for by the severe visitation of plague they went through in 1881, and as reported by me at the time, when it was currently stated about one-half of the inhabitants died.

"*Samarah*, the last of the shrines, does not appear in the returns, is a small town with about 3,000 inhabitants on the left bank of the Tigris, about 75 miles above Baghdad. Although several of the Chief Shiah families of Baghdad went to live there during the time the epidemic was raging here, there were no cases of cholera among them.

"It may be unnecessary to trace the disease in detail west, east, and north, but, as will be seen from the following, the epidemic travelled slowly in each direction, proceeding up the Euphrates as far as Hit, latitude 30° 48′, longitude 42° 47′: this is a small walled town on the right bank of the river; however, only one fatal case was reported on 28th October, though at the village of Kubiza, four hours distant from Hit, from the 28th October to the 9th November, 41 deaths were returned. Beyond this point I have no information further than what the Reverend Dr. Peters, an American traveller, gave me a few days ago, viz., that when passing through Dehr in December, the local authorities informed him there had not been a single case of cholera in the district.

"Moving towards the Persian frontier, cholera appeared at Bakuba on the 26th August, on which date there were five deaths; after the 6th September no further deaths were returned; the mortality was slight, a total of 15 being recorded. On the 2nd September two deaths occurred at Khanakin; the disease lasted until the 1st October; the total mortality was 103. Khanakin, latitude 34° 20′, longitude 45° 30′, is the nearest Turkish town on the frontier and about eight miles from Sabyi, the Persian frontier station, distant about 95 miles from Baghdad, through which many hundreds of Shiah pilgrims pass annually en route to and from Karbala and Najaf.

"On the 8th September five deaths were reported at Sharaban, a village between Khanakin and Bakuba; the disease was in all probability among people returning from Khanakin.

"At Kirmanshah (Persia), latitude 34° 19′, longitude 47° 13′, about 220 miles from Baghdad, I believe cholera first appeared about the 25th September. I am unable to give particulars regarding its progress, &c., as no official returns were sent from Persia; however, the British Agent writes from Kirmanshah on the 12th October.—'Pestilential disease has not yet quite decreased; mortalities are 20 to 25 per day.'

"Proceeding towards the north to Mosul, three deaths from cholera were reported on the 15th September at the village of Yenezeh, about 20 miles from Baghdad. The disease appeared at Taok on 17th September; at Kerkuk, latitude 35° 26′, longitude 44° 25′, in the Mosul Wilaiat, with a population of about 30,000, 10 deaths were reported on the 9th September; on the 15th the mortality had risen to 68, from which date it gradually declined; the last death occurred on the 19th October; the total number of deaths registered was 528. At Altin Keupri one death occurred on the 2nd October, and on the 6th three at Khoi Sandjak.

"At Sulimania, latitude 35° 33′, longitude 45° 36′, a town containing about 1,500 inhabitants, cholera broke out on the 23rd September; the last death was returned on the 25th November; the total mortality was 219.

"Erbil, latitude 36° 11′, longitude 44° 2′, population about 10,000. Cholera first appeared here on the 14th October and continued to the 2nd November, when one death was returned. Total number of deaths 176.

"Mosul, latitude 36° 20′, longitude 43° 11′. Cholera did not appear here until the 10th November. After the 30th November no further cases were reported; the total number of deaths during this time was 153.

"Ravendouz, latitude 36° 37′, longitude 44° 29′. The disease appeared here on the 26th October with two deaths, and the last death occurred on the 20th November; the total mortality was 70.

"Beyond this point I received no information regarding the progress of the disease.

"*Arab Tribes.*—It would be most difficult to give even an approximate statement as to what extent cholera prevailed among the tribes, many of whom have no fixed place of residence for any length of time; also there were not a sufficient number of medical

men at the immediate disposal of the Turkish Government to furnish each tribe with medical aid, and in consequence the returns in my opinion are somewhat defective. I extract most of them from the official bulletins: 'from the 23rd August to '1st September, 152 deaths among the Arab tribes of Kerim and Djilcha around 'Shamiya.' 7th September—'Arabs decamped around Shamiya, 50 deaths;' same date—'Afitch, within the last eight days, 162 attacked, 96 deaths;' 8th September—'Dychara, close to Nejef, in eight days 350 attacked, 204 deaths;' but it is not stated whether among settled Arabs or Nomads. 9th September—'During the last 15 days 'more than 400 deaths among Arabs encamped between Divania and Samara.' The above, I hope, will show how impossible it would be to give a correct return, and doubtless many Arab tribes suffered severely from the epidemic who have not appeared in the official bulletins. The total mortality as given above amounts to 902, but I fear to be anything like accurate; the number ought to be doubled.

"*Quarantine.*—On 5th August the following letter was received from the Baghdad Government by Colonel Tweedie:—

"'Under orders from Sublime Porte, and on application from Quarantine Inspector; requests issue of stringent orders to Messrs. Lynch and Co. that, until nature of choleraic disease at Shatra and Naseriyeh (on Euphrates) be ascertained, their steamers may touch at no intermediate station or receive at such cargo or passengers, but pass direct between Baghdad and Bussorah.'

"The same orders were issued to the steamers of the Oman-Ottoman Administration.

"On 9th, Her Britannic Majesty's Ambassador at Constantinople telegraphed 'ten 'days' quarantine on all arrivals from Bussorah.'

"On the 10th the Baghdad Sanitary Department informed Colonel Tweedie that a lazaretto was to be established near Kutul Amara, about 100 miles from Baghdad by road, where all passengers and cargo were to be landed and detained in quarantine for ten days; the steamer bringing them up the river returning to Bussorah, and a non-infected steamer was ordered to be sent from Baghdad to carry them on here. On 14th period of detention was increased to 15 days. On 16th lazarettos were established at Muhawil and Muasseyb, and cordons at Selahia, Tekrit, and Saklawia for the purpose of protecting Baghdad. On 19th steamer 'Majidiah' having passed up direct to Baghdad without stopping at Kút, orders were issued for her to undergo quarantine at Ctesiphon. It would be tedious here to recapitulate the restrictions placed on the transit of Her Majesty's mails by the fumigation of the same, and the wish of some officials, in the excessive discharge of their duties, to open the mail bags and disinfect each letter and packet to the utter destruction of many articles.

"On 20th Baghdad having been declared infected, restrictions on all river steamers were removed and lazaretto at Kút abolished.

"22nd.—To preserve towns of Divania, Hindiya, Hilla, Najaf, and Karbala, the cordon to north of Baghdad was reinforced; also a cordon was formed to the south of Bussorah to preserve Fao and other towns; a lazaretto was established at Bakuba to protect Khanikin, Mandali and environs.

"25th.—To prevent crowding. Sanitary Service requested no one to be taken on board steamers except civil and military officers proceeding on special duty and holding certificates from local authorities of Baghdad or Bussorah.

"All these excellent preventive measures against the spread of cholera proved unavailing, and to trace them further would be repetition. The disease moved slowly along every caravan route in the country, and to me it seems the imposition of quarantine had no effect in impeding the progress or in diminishing the force of the disease. In order to mitigate the hardships and delays of quarantine, it would be highly desirable that the Turkish Government (as regards cholera) should act upon the first recommendation of the technical committee of the International Sanitary Conference assembled at Rome, May 1885, viz.:—'all land quarantine and sanitary cordons are useless.'

"*Sanitary Defects.*—At Baghdad and most of the towns in the two provinces there are not conservancy systems; in certain classes great overcrowding with bad ventilation; no surface drainage; foul tanks in the courtyard of each house used as receptacles of every kind of filth, bad water, because among the lower orders it is used unfiltered; intramural burials and many other causes reported by me at the time to make this city a most flourishing hot-bed for any epidemic that may visit it.

"*Effect of Movement.*—In my opinion the almost universal desire evinced by every person to leave the city, when the outbreak of cholera occurred (though the movement

had a most depressing effect upon many persons compelled to remain), resulted in much benefit to families who went even a short distance from the town; in some cases to my knowledge in camps, numbering 200 persons, after one case, the disease disappeared.

"In conclusion, I beg to note many incidents in connexion with this epidemic have not been touched upon, as they were reported at the time they occurred; also I would wish to thank the 'Service Sanitaire' for the assistance and cordial support always given to me so as to enable me to return the daily list of deaths at Baghdad and other returns herewith forwarded."

Scientific memoirs.

The sixth part of scientific memoirs by medical officers of the Army of India is published concurrently with this report. It contains articles on the following subjects:—

On some species of Choleraic Comma-Bacilli occurring in Calcutta—Surgeon-Major D. D. Cunningham, M.B., F.R.S.

The Morbid Anatomy of a form of Biliary Cirrhosis in children in India—Surgeon J. B. Gibbons.

On the Habits of certain "Harvesting Ants"—Surgeon J. H. T. Walsh.

On two Autœcious Cæomata in Simla—Surgeon-Major A. Barclay, M.B.

Rhododendron Uredineæ—Surgeon-Major A. Barclay, M.B.

Dr. Cunningham's paper is in continuation of a brief report on the same subject, submitted to the Sanitary Commissioner with the Government of India in the early part of 1890, and contains an account of the results of continued observations and experiments conducted throughout the entire course of the year. It shows that in Calcutta cholera is associated with many different species of comma-bacilli, and that, therefore, Koch's theory of the existence of a single specific choleraic comma must be finally abandoned. It also points out that even the entire group of species cannot be regarded as the essential cause of the disease, but that, whilst this is so, there are some grounds for regarding them as of importance as factors which may possibly influence the outcome of the disease in individual cases due to the varying nature of the decomposition products which they individually manufacture.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR MADRAS FOR 1889.

(Surgeon-Major J. A. Laing.)

General Population.

Vital statistics.

The record of births and deaths during the year does not extend to the whole population as ascertained at the census of 1881, viz., 30,835,771; there are certain tracts of zemindary estates, &c., for which no birth and death returns are received. The total population for which returns were furnished in 1889 was 28,050,087, being 2,785,684 short of the total population.

The births registered in 1889 (exclusive of Europeans and Eurasians and still-births) numbered 867,523 and were in the proportion of 30·9 to 1,000 inhabitants. This is the highest birth-rate recorded in the Presidency for the past 19 years as will be seen from the subjoined table, and it is satisfactory to notice the improvement which has taken place in the registration of births:—

Years.	Population for which returns were received.	Births.	Birth-ratio per 1,000.	Deaths.	Death-ratio per 1,000.
1871	24,555,046	506,707	20·6	444,371	18·0
1872	30,147,779	543,325	18·02	501,482	16·6
1873	30,287,842	527,363	17·4	506,894	16·4
1874	30,360,221	569,631	18·7	516,848	17·0
1875	30,278,903	625,953	20·6	641,260	21·1
1876	29,157,056	619,748	21·2	680,384	23·3
1877	29,209,542	467,543	16·01	1,556,312	53·2
1878	29,127,205	341,388	11·7	810,921	27·8
1879	28,991,267	467,938	16·1	549,390	18·9
1880	28,778,097	641,769	22·3	454,101	15·7
1881	28,676,375	716,672	24·9	465,682	16·2
1882	28,887,111	743,777	25·7	470,700	16·2
1883	28,503,100	774,754	27·2	541,930	19·0
1884	28,151,952	810,102	28·8	650,335	23·1
1885	28,118,178	807,105	28·7	615,449	21·8
1886	28,043,538	837,077	29·8	553,927	19·7
1887	27,907,840	849,551	30·4	604,775	21·6
1888	27,852,474	833,345	29·9	597,015	21·4
1889	28,050,087	867,523	30·9	661,178	23·5.

Only five districts (Chingleput, Ganjam, Malabar, Salem, and South Canara) were the birth-rates lower than those in 1888, in two (South Arcot and Tanjore) they were the same, while in the remaining 14 districts they were higher. The increase was most marked in the districts of Kurnool, Madura and Trichinopoly, and the decrease in Salem and Ganjam. The highest birth-rates registered were 42·2 per 1,000 in Kurnool, 40·7 in Bellary-Anantapur, 40·4 in Madras, and 38·9 in Chingleput. The birth-rate was lowest in Ganjam (18·1); (excluding the Nílgiris) Vizagapatam comes next to it (22·0), and then Godávari (22·9). These three districts have for some years always returned the lowest birth-rates. The birth-rates in Vizagapatam and Godávari, although still far from satisfactory, yet show an improvement when compared with the ratios of the previous year. The decrease in the birth-rate for Ganjam is for the most part to be ascribed to the effects of the distress which prevailed in the district. Indeed a lessened birth-rate must always be a necessary consequence of famine, for, not only are the women at the child-bearing periods of life lessened in number by death and emigration from the affected districts, but the debility caused by protracted privation reduces the chance of their becoming mothers. In three districts (Kurnool, Madras, and Bellary-Anantapur) only was the birth-rate above 40 per 1,000, which may be taken as the standard, in ten it was over 30 and under 40, and in the remaining eight districts it was under 30 per 1,000.

Of the 867,523 births registered in 1889, there were 442,712 males and 424,811 females, or in a proportion of 104·2 males to every 100 female births, the corresponding percentage in 1888 being almost exactly the same.

Among the various sections of the population in each district the Hindus returned the highest birth-rate, viz., 31·2 per 1,000 of population, the Muhammadans next (28·4), and then Native Christians (24·6).

Taking the Presidency as a whole, there were 206,345 more births than deaths, registered, the birth-rate being 7·4 per 1,000 higher than the death-rate. In all the districts, with the exception of four (Ganjam, Vizagapatam, Madras, and Godávari) the births exceeded the deaths.

The rural birth-rate for the Presidency was, as usual, higher than the urban, the ratios per 1,000 of population being 30·9 and 28·5 respectively. This result may in some measure be due to births obtaining more local notoriety in villages than in towns of considerable size. In 11 districts (Bellary-Anatapur, Chingleput, Cuddapah, Kistna, Kurnool, North Arcot, Salem, South Arcot, Tanjore, Tinnevelly, and Trichinopoly), the birth-rates were higher in rural than in urban populations, the difference being most marked in Chingleput, Trichinopoly, and South Arcot.

During 1889 there were 661,178 deaths (exclusive of Europeans and Eurasians and born dead) registered in the Madras Presidency, corresponding to an annual rate of 23·5 per 1,000 of the population. This death-rate exceeded by 2·1 the rate for 1888, and was 2·0 above the average rate for the five years 1884–1888. The increase in the death-rate for 1889 is due to the exceptional amount of mortality registered in certain parts of the Presidency.

The following table shows in abstract form the means of comparing the mortality under the principal causes of death during 1889 with the result of 21 previous years :—

Years.	Total Deaths.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	Other Causes.
1868	390,956	8,036	34,330	105,692	—	9,242	233,659
1869	451,981	21,034	17,448	132,346	—	9,310	271,843
1870	451,020	55,867	11,252	151,027	—	12,325	220,549
1871	444,371	17,656	20,823	192,469	38,928	15,323	159.172
1872	501,482	13,247	39,074	214,148	39,387	15,150	180,476
1873	506,894	840	51,784	222,843	36,392	14,251	180,784
1874	516,848	313	48,343	226,220	37,993	13,065	190,914
1875	641,260	94,546	24,775	252,042	37,484	12,421	219,992
1876	680,384	148,193	23,469	230,092	38,176	11,175	229,279
1877	1,556,312	357,430	88,321	469,241	133,366	16,460	491,494
1878	810,921	47,167	56,360	374,443	48,083	15,007	269,861
1879	549,390	13,296	17,840	285,477	23,218	12,619	196,940
1880	454,101	613	14,529	209,940	19,622	10,845	198,552
1881	465,682	9,446	15,776	203,542	18,961	11,527	206,430
1882	470,700	23,604	20,159	188,561	19,958	11,611	206,807
1883	541,930	36,284	37,975	203,786	22,098	11,509	230,278
1884	650,335	75,476	61,247	215,977	28,775	11,502	257,358
1885	615,449	58,109	34,726	218,786	31,209	11,659	260,960
1886	553,927	12,417	17,129	221,679	27,379	13,103	262,220
1887	604,775	28,359	21,472	240,860	26,679	11,328	276,077
1888	597,015	58,677	21,858	204,561	27,721	11,401	272,797
1889	661,178	76,020	29,138	230,172	29,122	11,506	285,220

Under every one of the four great classified causes of death, as well as under unspecified causes, there has been an increase in the registered mortality. As the classification of the causes of death in this country is still very imperfect, having to depend on unprofessional opinion for the facts, the registration of the actual "causes of death" must be, to a great extent, incorrect. Thus, in the Ganjam district, where there has been more difficulty this year than usual in the classification, the deaths registered from cholera alone were 12,902, being at the rate of 14·0 per 1,000 of population, and as it is not always easy to diagnose deaths from cholera from the last stages of famine diseases, there can be no doubt that many of the deaths registered as from cholera were in reality deaths from chronic starvation.

The 661,178 deaths included 341,867 of males and 319,311 of females. The annual death-rate per 1,000 was 24·6 for males and 22·5 for females. In accordance with the experience of former years, the male is in excess of the female death-rate. The excess

of male over female deaths was most marked in Ganjam, where distress prevailed, the rate per 1,000 being 45·6 for males and 36·4 for females. The statistical evidence of the famine relief camps of 1877 showed that mortality resulting from distress was much more marked in men than in women. In the whole Presidency for every 100 females who died, 107 deaths among males were registered.

As usual, the mortality among infants under one year of age was high; the average death-rate among infants under one year of age calculated on the number given in the census of 1881, was 154·3 per 1,000 of population. The mortality amongst children under five years of age was very high in comparison with other periods of life. In fact, the deaths in children under five years of age formed 35·5 per cent. of the total deaths. It cannot be too distinctly recognised that a high rate of infant mortality is a proof of the insanitary condition of most of the towns and villages in the Presidency. The period of greatest immunity was, as in 1888, in the age of above 10 and under 15 years, the rate being 7·2 per 1,000. For those above 60 and upwards the mortality was at the rate of 55·5 per 1,000.

The total deaths by sexes show that females have a better chance of life than males from infancy up to 15 years of age, and also from 30 years and upwards. Between the ages of 15 and 30 the death-rate amongst males is less than that of females.

According to classes, the deaths registered amongst Hindus were in the proportion of 24·0 per 1,000, of Muhammadans 19·9 per 1,000, of Native Christians 16·7 per 1,000, and of Other Classes 15·6 per 1,000. In 10 districts (Chingleput, Coimbatore, Cuddapah, Kurnool, Madura, Nellore, Nílgris, Salem, Tanjore, and Tinnevelly) no deaths were recorded among "other classes."

During 1889 the largest number of deaths (65,759) took place in January, and the least (47,406) in February. The most unhealthy months were January, July, and December, and the most healthy February, March, and April. Usually the most unhealthy months are December and January, and the most healthy April and May. A sudden rise in the death-rate usually occurs in December, and this was also the case in 1889.

As has been the case for some years, the mortality in Madras was higher than in any other district in the Presidency, being at the rate of 42·6 per 1,000 of population. The lowest death-rate (15·6) occurred in Nellore. In 11 districts (Madras, Ganjam, Bellary-Anantapur, Chingleput, Vizagapatam, South Arcot, Kistna, Godávari, Madura, Salem, and Coimbatore) the death-rates per 1,000 of population were higher in 1889 than in 1888, but in the others they were lower. The largest increase in mortality took place in Ganjam. For 1888 the death-rate per 1,000 of population of this district was 17·9, but for 1889 it was 40·9. The cause of this large increase in the death-rate for 1889 was owing to the effects of the famine which prevailed in the district. Famine must inevitably be accompanied by a largely increased mortality; and, considering the difficulties that had to be met in the district in affording aid to a people difficult at all times to manage, a people trammelled with caste prejudices, and who became dispirited, hopeless, and apathetic, who had no other resource for self aid but a blind fatalism, it is a matter of surprise that the mortality was not even yet still higher. It must have been infinitely greater if the Government had not organised a system of aid which was most thoroughly calculated to bring relief to all who sought for it. The increased mortality in the districts of Vizagapatam and Godávari was due to an increase of deaths under all heads, but chiefly under cholera and fevers. The greatest decrease in the death-rate took place in South Canara, where the deaths under all the principal causes were much less than those specified in the preceding year, especially those from cholera and small-pox.

The death-rates among the urban and rural populations were, respectively, 28·0 and 22·9 against 27·9 and 20·7 in 1888. In all the districts, with the exception of Trichinopoly and South Arcot, the urban death-rate was higher than the rural. The death-rate of the urban population being higher than that of the rural population, shows how much has still to be done for the sanitation of our large towns, and another important conclusion to be drawn from these figures is that improved sanitation is much more urgently required in the towns than in the country.

The average death-rate of the 55 municipal towns was 29·3 per 1,000 or 6·0 higher than the district rate. In 27 municipalities the death-rate ranged from 30 to over 50 per 1,000, in 22 from 20 to 30, and in 6 the death-rate was below 20 per 1,000. The low death-rate in the last six towns is certainly due to defective registration.

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Chief Diseases.

Cholera.

A total of 76,020 persons died from cholera in 1889. This number exceeds the mean of the previous 10 years by 44,392, and is the highest mortality recorded to have taken place from cholera since 1877—*vide* table on page 100.

The following table shows the ratios of cholera deaths for the past 22 years: —

Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.
1868	0·3	1876	5·08	1884	2·7
1869	0·8	1877	12·2	1885	2·06
1870	2·3	1878	1·6	1886	0·4
1871	0·7	1879	0·4	1887	1·01
1872	0·4	1880	0·02	1888	2·1
1873	0·02	1881	0·3	1889	2·7
1874	0·01	1882	0·8		
1875	3·1	1883	1·2		

In no month of the year was cholera absent from the Madras Presidency. The total mortality was highest in July and June (July 13,184 deaths, June 11,632). From July the mortality fell rapidly, and in October only 1,656 deaths were recorded; but in November and December there was again a rise. As regards this Presidency, cholera usually attains its maximum degree of intensity during the cold weather months, but this year was an exception to the rule. In June and July 1889 many deaths from cholera were registered in the Vizagapatam and Godávari districts, and in the months of April, May, June, and July the mortality from cholera was very great in the Ganjam district.

In every district in the Presidency deaths from cholera were reported during the year, and in 13 districts cholera was prevalent in them more or less throughout the year. In South Canara deaths from cholera were only recorded in the months of January, February, and March. As before mentioned the mortality from cholera in 1889 is the highest recorded since 1877, and the increase is due to the large number of deaths registered under cholera in the Ganjam district. In 1889 there were 13,932 deaths recorded from cholera in the Ganjam district against 688 in 1888. The death-rate was 14·2 per 1,000 of population in 1889, 0·7 in 1888, and 0·9 the mean ratio per 1,000 for the previous five years. It must, however, be remembered that in 1889 in the Ganjam district the registration of cholera mortality was a good deal confused with famine, diarrhœa, &c., and that the number of cholera deaths included in the returns has no doubt been exaggerated from this cause. The coincidence, however, of bad seasons in this Presidency with maximum cholera prevalence is remarkable. Thus, the year 1833–34 of the Guntúr famine, in which more than 50 per cent. of the people disappeared, was also a time of maximum prevalence of cholera. The years 1853–54, which were years of drought, were also years of unusual cholera, and the same may be said of the years 1865–66 and 1876–77. In the Ganjam district in 1889, in consequence of the prolonged drought, the people were in a semi-starved state for months, and in parts of the district the drinking-water was more impure than usual, because, in consequence of the drought, it was much reduced in quantity and, therefore, had a larger percentage of suspended and dissolved impurities. The disease was present in the district before the food dearth was felt, but it was aggravated by the wandering habits of the famine sufferers, by the resort to strange and unnatural articles of diet, and by the use of contaminated water. In fact, all the normal insanitary conditions of native life, viz., bad feeding, bad housing, bad conservancy, and bad water, were all intensified by the distress which prevailed in the Ganjam district. In January there were only 28 deaths registered from cholera in the Ganjam district, in February 58, and in March 115. The mortality then suddenly rose, and in April 3,367 deaths were registered, in May 4,209, in June 3,218 and in July 2,040. The mortality then suddenly decreased, and in August only 701 deaths were recorded, and in September 54. It may be here remarked that for the first five months of the year there was very little rain, but in June 6·17 inches were registered, and in July as much as 10·34 inches.

In the districts of Godávari and Vizagapatam the epidemic was very severely felt. In the former district the death-rate was 5·4 per 1,000 of population and in the latter 5·0. In 11 districts (Chingleput, Cuddapah, Kurnool, Madras, Malabar, North Arcot, Salem, South Canara, Tanjore, Tinnevelly, and Trichinopoly) the death-rates were lower in 1889 than in 1888. In the following districts very few deaths were recorded from

cholera:—Nílgiris 12, Madras 171, Kurnool 339, South Canara 353, Malabar 489, and Cuddapah 496.

Of the 77 principal towns of the Presidency, in 72 deaths from cholera were registered, and in only five there were no deaths recorded. In 27 towns the cholera death-rate in each was above 5 per 1,000 of population, and this is very high.

Of the 55 municipal towns (excluding Madras) 53 were affected. In 33 municipal towns the death-rate exceeded that of the districts and in 20 it was less. In only two municipalities (Cannanore and Tellicherry) no deaths were recorded.

Such measures as could be taken were resorted to by the district authorities to prevent the spread of the disease. From the reports received no new light has been cast upon the etiology of cholera. Overcrowding, local insanitary conditions, bad water, and unsuitable and unwholesome food have been indicated as predisposing elements for the production of cholera, and all that was required was an exciting cause for its development. There is, however, strong evidence to show that there is a close connexion between impure water and cholera, and that dissemination of the disease is largely dependent on water-fouling. It has also been found that cholera finds difficulty in taking root in places with a pure water supply.

Small-pox.

The total deaths registered in 1889 from small-pox were 29,138 against 21,858 in 1888 and a quinquennial mean of 31,286. The small-pox death-rate for the Presidency during the year under review was 1·0 per 1,000 of population, for 1888 it was 0·8, and for the five-year period 1884–88 the annual average rate was 1·1 per 1,000. The mortality from this cause for the present year is higher than that of 1888, but less than the average of the preceding five years.

There were 5,641 children under one year of age and 12,260 over one and under 12 years of age who died from small-pox. These figures are instructive as showing the extreme proneness of the disease to attack infants and young persons. Nearly two-thirds or 61 per cent. of the small-pox mortality in 1889 occurred in children under 12 years of age. The attention of the Vaccine Department has frequently been called to the necessity of prosecuting vaccination amongst young children, preferably those under one year of age. But there are difficulties in the way, and the people as a rule make great objections to the vaccination of children below one year of age. A test of the efficiency of vaccination in a district or town should be the proportions of vaccinated under one year of age to the registered births in the district or town.

Although the total for 1889 exceeded that for 1888, there was a decrease in the death-rate in eight districts. In Coimbatore the death-rate was the same as for 1888, and, in the 12 (Anantapur-Bellary, Chingleput, Cuddapah, Ganjam, Codávari, Kistna. Kurnool, Madras, Salem, South Arcot, Tanjore, and Vizagapatam) the rates were higher In last year's report it was noted that the small-pox mortality was high in the Kurnool and Ganjam districts, and for the present year these two districts have again the highest recorded death-rates from this cause. In the Ganjam district the ratio per 1,000 of population was 4·3 against 2·2 in 1888. The condition of the population of this district in 1889 was, however, such as to be eminently favourable to the spread of a contagious disease like small-pox. Nearly all historical records of scarcity in India show that small-pox is a most common attendant on those forms of distress that cause disruption of village and family life, and tend to the massing of the people in crowds. The indifference of the people to the disease and their thoughtless exposure of the unprotected to contagion tend greatly to its epidemic spread. In the Kurnool district the small-pox mortality amounted to 4·2 per 1,000 during the year under report against 2·4 in 1888. In this district vaccination has always been opposed by the people, and its practice has been carried on under many disadvantages.

The District Medical and Sanitary Officer, Kurnool, in his annual report states:—

"A most severe epidemic small-pox swept the district. No less than 2,913 deaths "occurred. This was nothing but what was to be expected in a district where vacci- "nation has hitherto met with steady opposition, and where Government has refused, "though twice asked by the District Board to do so, to sanction compulsory vaccina- "tion. A grant of Rs. 1,000 having been made by the Board, I organised a Special "Vaccination Department to deal with the epidemic. They vaccinated over 17,000 "cases in addition to those performed by the regular staff during the year.

"Villagers have, as a result of this epidemic, altered their views as to the futility "of vaccination."

The mortality in the districts of Madras, Tinnevelly, and Godávari was slight, the ratio per 1,000 of population being 0·1 in each.

In all municipalities with the exception of eight (Masulipatam Guntúr, Pálghat, Cochin, Nellore, Coonoor, Tirupati, and Ellore) deaths from small-pox were recorded. The highest death-rate, viz., 6·7 per 1,000 of population, was in Vizagapatam, the district rate being only 0·5. Berhampore stands next with a ratio of 5·1 per 1,000 of population. The lowest ratio (0·03) per 1,000 of population took place in Mangalore.

Fevers.

The registered mortality from fevers during the year was 230,172 or a ratio of 8·2 per 1,000 of the population, against 204,561 or 7·3 per 1,000 in 1888, and 220,373 or 7·8 per 1,000 the mean of the previous five years. There was thus an increase of 25,611 for the year under report as compared with 1888. On looking at the table on page 100 it will be seen that, with the exception of "all other causes," the greatest number of deaths were, as usual, due to fevers. As mentioned in last year's report, although it is natural enough that cholera should cause more panic than fever, yet in reality fevers ought to be more dreaded, as they are the cause of a much greater mortality than either cholera or small-pox. A principal cause of the increased mortality from fevers in 1889 was doubtless due to the heavy rainfall which occurred in some districts, producing a water-logged condition of the country, which is well known to be a most common cause of malarial diseases. Although we are yet in the dark as to the actual cause of fevers, yet it has been proved beyond all manner of doubt that efficient drainage, agriculture, and improved sanitary conditions may transform the whole aspect of a country, changing its inhabitants from pitiable objects into vigorous, healthy, and happy people. We have only to turn to England for an example of the advantages of measures of this kind, and similar results have been achieved also in other parts of the world—Demerara for example—all proving that malarial fever may be made to disappear before the face of thorough drainage and agriculture. What can be done with limited provincial and local means to remedy defective drainage affecting vast tracts of country is a question surrounded with great and obvious difficulties. The clearing of water-courses, removal of obstructions, and formation of fresh channels, are measures which may have an effect over very large areas which cannot be reached by ordinary drainage.

In 12 districts (Bellary, Chingleput, Coimbatore, Ganjam, Godávari, Kistna, Madras, Madura, North Arcot, Salem, Tinnevelly, and Vizagapatam) the mortality from "fevers" was higher during the year under review than in 1888, and in the remaining 10 (Anantapur, Cuddapah, Kurnool, Malabar, Nellore, Nílgiris, South Arcot, South Canara, Tanjore and Trichinopoly) it was lower. The rate of fever mortality is still very high in Cuddapah, Ganjam, Kurnool, Nílgiris, and Vizagapatam. In two of these districts (Ganjam and Vizagapatam) the death-rate was higher in 1889 than in 1888 and in Cuddapah, Nílgiris, and Kurnool it was lower. In Vizagapatam district the increase in the mortality was very marked, viz., 17·6 per 1,000 of population in 1889 against 9·9 per 1,000 in 1888. In this district the rainfall in 1889 was much greater than in 1888, viz., 53·56 inches in 1889 against 34·94 in 1888. In the Ganjam district the fever-rate per 1,000 of population in 1889 was 16·2 against 11·7 in 1888. In this district the rainfall was more than double that in 1888, viz., 59·42 inches in 1889 against 27·09 inches in 1888. The condition of the poor was also such that they more easily fell victims to diseases like malarious fever.

The largest number of deaths (25,203) was recorded in the month of December and the fewest (15,306) in February.

Fever was less prevalent in towns as a rule and more prevalent in rural circles during the year under report, the death-rate for the districts being 8·3 per 1,000 of population, while that for municipal towns was 5·8. It is possible that the low rate of mortality in towns as compared with that in rural circles is partly due to the indiscriminate classification of all diseases with inflammatory symptoms as fever in the more rural and less educated tracts of the country. In 15 towns (Kurnool, Bezváda, Rajahmundry, Bellary, Tirupati, Tuticorin, Ádóni, Chidambaram, Anántapur Conjeeveram, Tanjore, Kumbakónam, Máyavaram, Negapatam, and Mannárgudi) the mortality rate from fevers was greater than that of the districts.

Bowel complaints.

There were 29,122 deaths recorded under bowel complaints in the Presidency during the year, or 1,401 more than last year, when 27,721 deaths were registered. The death-rate for the year under review was 1·0 per 1,000, being the same as that for 1888, and also for the average rate per 1,000 of population for the five-year period 1884–1888. In eight districts (Coimbatore, Ganjam, Godávari, Madras, Madura, North Arcot, Salem, and Vizagapatam) the death-rate was higher in 1889 than in 1888, in seven (Kistna, Kurnool, Nellore, Nílgiris, South Arcot, Tanjore, and Tinnevelly) it was

the same, and in six (Bellary-Anantapur, Chingleput, Cuddapah, Malabar, South Canara, and Trichinopoly) it was less. Madras, as usual, heads the list with the high death-rate of 7·5 per 1,000 of population or 1·0 more than in 1888. Following it comes Chingleput with a ratio of 4·0 per 1,000 against 4·2 in 1888, and next to it come Malabar and South Canara with 1·8 each. In 1888 the death-rates per 1,000 of population for South Canara and Malabar were 2·3 and 2·0 respectively. Madras, Chingleput, and South Canara usually return the highest death ratios from bowel-complaints. The lowest ratios, viz., 0·3 and 0·4 per 1,000, were returned by the Kistna and Vizagapatam districts respectively.

The greatest mortality was registered during the month of January, and the experience of 1889 has been in accordance with the general rule. The fewest deaths, as usually happens, were recorded in April.

The rates of mortality from bowel-complaint in towns, as is always the case, was much higher than in rural tracts. In Parlákimedi, where there was distress, no deaths from bowel-complaints were recorded, notwithstanding the intimate relation there is between defective food-supplies and bowel-complaints. In towns the ratio of bowel-complaint mortality was 3·5 per 1,000 and in the country only 0·9 per 1,000. In only six towns (Conjeeveram, Cannanore, Tellicherry, Anántapur, Adóni, and Masulipatam) was the death-rate lower than in districts. The highest death-rate (9·5) was recorded at Tuticorin, and this town also stood at the head of the list last year. The lowest death-rate (0·02) was registered at Masulipatam.

Under the heading "injuries" 11,506 deaths were recorded during the year under review, giving a death-rate of 0·4 per 1,000. In 1888 the deaths from injuries were 11,401, or 105 less than the deaths registered in 1889, and the death-rate per 1,000 of population was 0·4. There was an increase in the number of deaths from wounds and accidents and persons killed by snakes and wild beasts in 1889 as compared with 1888, but a decrease in the number of suicides. Nearly two-thirds of the total mortality from injuries in 1889 was caused by wounds and accidents. As usual, the greater number of suicides were women—1,061 of the cases being men and 1,331 women. As is usually the case the highest death-rates from injuries (0·8) was obtained by Nellore and the lowest (0·02) by Nílgiris. Injuries.

The registered mortality from "all other causes" amounted to 285,220 in 1889 against 272,797 in 1888, and 265,882 the mean of the five years 1884–88. The ratios per 1,000 which these figures bear to population are 10·1, 9·8, and 9·4 respectively. All other causes.

Sanitary Works.

The number of towns administered by the District Municipalities Act was the same as in 1888, viz., 55. Municipalities.

Sanitary Works.—No new works of any importance were undertaken during the year; but drainage and water-supply schemes have been prepared for some towns and will, it is expected, be begun this year. In Cuddapah the scheme for supplying the town with good and sufficient water from the Bugga springs was in progress and will be completed this year. A good deal of work was however done in the way of repairing and cleansing of tanks, and wells. in the sinking of wells, in the repair and construction of latrines, drains, dust-bins, markets, slaughter-houses, &c., and in the improvement of town sites, by filling up hollows and removal of prickly-pear and other rank vegetation.

Water-supply and Drainage.—Their condition was generally much the same as detailed in former reports as will be seen from the appended abstracts of the sanitary reports received from the several municipalities. The sources of water-supply are chiefly tanks, wells, rivers, canals, and irrigation channels. Greater attention is now, however, being paid to conserve and guard the drinking-water supplies from pollution. Generally speaking, there is no regular system of drainage. The drains consist chiefly of side-cuttings for surface drainage only. In a few towns natural drainage is fairly good. In some, masonry drains exist, but they form no part of a regular system, and from faulty construction or bad repair are of little or no use, and in some cases are more a nuisance than a boon. In many towns cesspools still abound, which form receptacles for the drainage from houses, &c. Generally both the water-supply and drainage of the greater number of towns are far from satisfactory; but in the abstracts

of the sanitary reports which follow, it will be seen that schemes for some towns have been prepared. Hitherto the absence of professional engineering advice in devising schemes on a systematic plan and want of funds were great drawbacks towards substantial and permanent improvements in these as well as in other matters connected with sanitation. However, now that a Sanitary Engineer to Government has been appointed specially to give advice to local bodies in devising schemes and forming plans and estimates for the execution of works of a sanitary nature in a complete and systematic manner, the former deficiency will be supplied, and by the powers conferred on Municipal and District Boards by recent legislation for the raising of funds for the execution of local improvements, the latter difficulty can, to a great extent, be overcome.

Conservancy.—The system of conservancy pursued in almost all the towns is much the same. The street sweepings, other refuse matters, &c., and contents of dust-bins and latrines are removed daily and carted away outside municipal limits and are either buried or burnt, thrown on the fields, or sold as manure. There were in all 7,743 dust-bins and 948 public latrines maintained in the 55 municipalities. The number of dust-bins fell from 8,005 in 1888 to 7,743 in 1889, being less by 262; and this occurred chiefly in Wálajápet, Kumbakónam, Vániyambádi, Salem, and Mannárgudi, where the numbers were reduced by 284, 235, 134, 68, and 44 respectively, In many of the towns the number of dust-bins was increased, the greatest increase (87, 80, 58, 53, and 52) occurring in Rajahmundry, Vizianagram, Vizagapatam, Nellore, and Bellary respectively. It is satisfactory to note that on the recommendation of the Sanitary Commissioner the old masonry fixtures are being gradually replaced by moveable corrugated iron or wooden dust-bins. The number of public latrines, though greater by 33 than in 1888, cannot be considered as ample. It represents an accommodation of only 1 to every 1,535 people. There should at least be, as noted by Government, 1 to every 1,000 inhabitants. An adequate latrine accommodation in convenient and judiciously selected sites is a very important element in the conservancy of a town, and where this has been deficient, sanitary inspections disclosed that streets, narrow lanes, bye-paths, and quiet corners are often resorted to for the purposes of nature to the prejudice of the sanitary condition of the town and public health.

Private scavengering was in force in 39 towns, being two more than in 1888. It was newly introduced during the year in Periyakulam and Cuddapah. 17,500 private latrines were scavengered by municipal agency or 1,429 more than in 1888, thus indicating a considerable progress in the system. In 25 towns, exclusive of those in which it was newly introduced, the increase ranged from 1 in Berhampore to 406 in Tuticorin. In six there was a retrograde movement in this respect, notably so in Srírangam, Tanjore, and Palamcottah, where the numbers fell from 1,995 to 1,648, 1,026 to 819, and from 250 to 100 respectively. The greatest number of private latrines managed under municipal control was in Mangalore 2,387, next in Tuticorin 1,697, then in Srírangam 1,648, Bellary 1,634, and Negapatam 1,055.

The total receipts of all the mofussil municipalities as obtained from the budget estimates received in this office amounted to Rs. 20,42,070 during 1889-90 representing an incidence of Rs. 1-6-5 per head of population. In 1888-9 the receipts were Rs. 19,88,130 and the incidence Rs. 1-5-10. The sanctioned sanitary allotment, as shown in the sanitary reports received from the several municipalities, amounted to Rs. 6,57,328, or 32·1 per cent. of income, which may be considered, on the whole, as a fair contribution towards sanitation.

Of the total sanitary allotment Rs. 4,25,620 or 64·7 per cent. were spent during the nine months of the year ending with December 1889, leaving Rs. 2,31,708 or 35·3 per cent. to be spent in the following three months of the year. During the year 1888-89, as shown in the sanitary reports received in 1890, out of a sanitary allotment of Rs. 6,50,791, Rs. 5,75,292, or 88·4 per cent., were spent during the year, leaving Rs. 75,499 or 11·6 per cent. unexpended at its close. The expenditure in 1889–90, though not quite commensurate with the period for which the transactions represent, may be considered as fairly satisfactory, and it is to be hoped that the close of the year will have shown that the whole amount has been fully, or nearly so, utilised. In 22 towns the expenditure during the nine months exceeded 70 per cent., Guntúr, Masulipatam, and Coonoor, setting a laudable example in having spent as much as 96, 93, and 88 per cent. respectively of the sanctioned allotment. In Cocanada the expenditure exceeded the allotment, the excess being chiefly due, as explained by the Chairman, to an increased outlay over the sanctioned allotment having been incurred in connexion with water-supply and "other sanitary objects." In 27 towns the expenditure ranged between 57·0 per cent. in Karur, and 69·7 in Cuddapah. In the remaining six it was

as follows:—Tinnevelly 23·7 per cent., Anantapur 24·6, Tellicherry 40·2, Tirupati 41·1, Vellore 43·3, and Anakápalle 44·5. In Tinnevelly out of an allotment of Rs. 12,150 for water-supply, Rs. 109 were spent in the nine months; in Anantapur out of an allotment of Rs. 5,560 for improvement of village sites and construction and repair of latrines, Rs. 270 were spent, and in Tirupati out of an allotment of Rs. 3,895 for conservancy, only Rs. 1,577 or considerably less than half were spent; hence the low percentage of expenditure in these towns.

District local fund boards.

During the year the Presidency was administered under Act V. of 1884 by 21 district boards, being the same in number as in 1888.

Sanitary Works, Water Supply, Drainage, and Conservancy.—There is nothing new to add in these respects to the remarks made concerning them in the report for 1888. The sanitary improvements effected were of a nature similar to those detailed in former reports, consisting chiefly in improvements to water-supply and of village sites and in the repair and construction of markets, slaughter-houses, dust-bins, latrines, drains, &c., and other minor works. The monthly reports received during the year under G.O., No. 1274 L, dated 6th June 1889, Local and Municipal, from the several taluk boards show progress in these directions. The improvements to water-supply consisted in the construction of several new tanks and wells, and in the repair, &c., of the existing old ones; and the improvements to village sites were chiefly the removal of prickly-pear and rank vegetation, &c., in several villages. There is no regular system of drainage in any of the local fund districts; the drains, as a rule, are mere side-cuttings for surface drainage only. Sewage from houses flows into the streets or into the back-yards where it sinks into the soil or is caught in cesspools. The sanitary reports received from the several districts show that out of a total of 42,862 towns and villages, 746 of them enjoyed the benefits of a scavengering establishment, being 75 more than in the year before. The greatest advance made in this direction was in Godávari, Malabar, and Kistna, where in 44, 17, and 15 more towns and villages conservancy establishments were, for the first time during the year under review, maintained. In Cuddapah there was a decidedly retrograde movement, the number of conserved villages having been reduced by 31. In 11 districts the increase ranged between one and seven, and in four the numbers were the same.

The total amount set apart for sanitation by the 21 district boards for the year 1889–90, as gathered from the sanitary reports received, amounted to Rs. 5,63,332 against Rs. 5,10,359 in 1888–89. Taking one-third land cess as the available income in which sanitation may claim a share, the allotment proportionally to it is in the ratio of 37·7 per cent., which, on the whole, may be taken as a fair share of the revenues for sanitation. Except in Malabar (11·1), Nellore (14·3), Ganjam (18·0), Vizagapatam (18·4), and South Canara (20·8), where the percentages are somewhat low, the allotments made by the other districts are satisfactory, being above 25 per cent. of the available income. In the districts of Coimbatore, Kurnool, and Salem they were as high as 74·8, 70·4, and 60·9 respectively, and in three others (Tinnevelly, Nílgiris, and Madura) the percentages were 57·3, 53·2, and 52·7 respectively.

Of the total sanctioned amount, the outlay for the nine months ending with December was Rs. 3,09,808 or 54·9 per cent. of the sanctioned grant, being a little more than half the amount: Rs. 2,53,524 or 45 per cent. were left unexpended. This is not satisfactory. The outlay should have amounted to three-fourths or at least two-thirds of the allotment. In only six districts did this occur, viz., Tanjore (85·4), Nílgiris (75·4), Ganjam (71·4), Vizagapatam (71·0), Chingleput (70·3), and Anantapur (69·8). In nine districts the percentages of expenditure ranged between 52·6 and 62·7, and in the remaining six they were below 47.

General Remarks and Personal Proceedings.

During the year I visited 24 municipal towns, and the Deputy Sanitary Commissioner also 24. In addition many smaller towns and villages were inspected. The time I spent on inspection duty was over five months, and by the Deputy Sanitary Commissioner over six months.

As usual, I was accompanied in my inspections of municipalities by members of the Municipal Council, and I then took occasion to point out to them those sanitary defects which attracted my attention. The defects I observed were pretty much the same in all towns I visited, and it is very desirable that definite schemes should be formulated

for each municipal area and kept carefully in view in carrying out immediate minor requirements.

In most municipal towns the drainage is defective and faulty; but some towns have now had drainage schemes prepared for them and will be taken in hand this year. The question of the best methods of disposal of the sewage will arise as drainage schemes for towns progress, and the plan of applying it to land and utilising it for irrigating and manuring is undoubtedly the best one. The only municipality at present in the Presidency which has sewage farms is Madras itself, and they are a success. In some municipalities the numerous cesspools which exist in them are daily emptied by municipal agency, and I have recommended these municipalities to remove the sewage to a distance from the towns and utilise it for irrigating and manuring purposes. Street sweepings and nightsoil are, as a rule, not thoroughly utilised by municipalities. Some municipalities derive a good income from their sale; but in others the arrangements for their disposal are indifferent. Many Municipal Councils are now, however, paying more attention to the disposal of their street sweepings and nightsoil, and hope to derive larger incomes in future for them. The water-supply of most of the large towns is still very indifferent, but schemes for obtaining a wholesome water for some of the larger towns are under consideration and will be commenced this year. In some districts there has been progress made in sanitation, and a good deal has been done in the way of cleansing wells and protecting the mouths with masonry platforms. The utility of cleaning wells periodically and protecting them from direct pollution is unquestionable, but in places there appears to be some idea that if a well has been cleansed out and its mouth protected, and if the water is clear and sweet to the taste that it may be regarded as pure and safe. The fact of water from a well being clear and sweet is not a guarantee of its being pure, and wells sunk within a town are, as a rule, a most unsafe source of supply. In the work of forwarding sanitary improvements, the District Board of Kurnool has evinced an active interest and has effected a number of changes which, when completed, will, it is anticipated, render the district more healthy than it has been. Dr. King, the District Medical and Sanitary officer, in his annual report writes with regard to sanitary advance during the year in the Kurnool District:—

"The District Board, recognising a want I had frequently impressed upon them as to supervision of sanitary works, requested the sanction of Government for the appointment of an overseer to work in my office. During the year a full scheme for the sewage, conservancy, and water-supply for the town of Nandyál was prepared. It was duly submitted to Government and obtained its approval. But it considered the expenditure too much for a single town. Thus, works partially undertaken have been abandoned. Considerable good, however, has been accomplished by the complete reformation and sewerage of one street.

"A scheme for protection of the wells of the important cusbah town of Koilkuntla, and a small drainage system was sanctioned by the Board, and has been carried out during the year. It is anticipated that much good will be derived by showing ryots practically how advantageous the use of sewage water is in cultivation.

"Six new wells after standard designs were sanctioned during the year, of which four will probably be finished.

"Plans and estimates were also made for the water-supply of Yeldurty and will be in part finished before the end of the official year.

"A scheme for the laying out of the new village site of Dhone has been nearly completed and land has been purchased by the Board.

"A new village site has also been procured for the 'Malas' at Nandyál.

"The estimates framed by Tahsildars were all sent through this office to the President, District Board. Where they were found unsuitable sanitarily, the Board was advised not to adopt them.

"Thus much bad work has been saved and such as has been carried out by the Board this year will bear scrutiny from a sanitary point of view. Much time was taken up in discussing a scheme which I placed before the Board for conserving the whole of the villages of importance at once; but, instead of a balance of nearly a lakh which the Board has had unexpended from year to year, it was found this year that there was a deficit. The suggestion to borrow from Government for this important object was lost by the uneducated ryots, who form the bulk of the Board, voting in a body against the proposal."

The question of village sanitation is a far more difficult question to deal with than that of towns, and a sanitary scheme for each village is, under the present circumstances, too much to hope for. To overcome the sanitary evils which are present everywhere

in villages, patience and consideration are required, as nothing much can be done very quickly, and certainly nothing should be done hastily if we mean to avoid causing widespread discontent. We have to reckon upon not only with the custom of centuries, but with blank disbelief in our theories and entire absence of disgust or even of a sense of inconvenience, under conditions of life and amid surroundings of a kind which people in some highly-civilised European countries have come to look upon with distaste or abhorrence, and, in these circumstances, there is, when attempting the introduction of new sanitary measures in villages, obvious need for much circumspection. It does not follow, however, that nothing can be done in the way of village sanitation, but we must look rather to what the villagers may, without undue pressure, be induced to do than to what professional opinion would regard as the best thing to do if only it were practicable.

In August 1889 a Sanitary Board was sanctioned for the presidency, the Board for the present consisting only of the Sanitary Commissioner and the Sanitary Engineer. The Board will work in concert with the Collector of any district for the purpose of planning or carrying out any particular sanitary work or works in his collectorate.

In July 1889 Dr. McNally visited the village of Sríharikóta, Nellore district, to inquire into the cause of the prevalence of elephantiasis in this village, and his report was submitted to Government. No new light was, however, thrown on this disease.

There were 409 places inspected during the past year against 412 in 1888. 105 places were inspected more than once during the year. In all districts inspection work was done. The vaccination work was inspected also at the same time, and from the reports received there is evidence that in respect of both sanitation and vaccination good is resulting from these inspections.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR BOMBAY FOR 1889.

(*Dr. C. W. Macrury.*)

General Population.

In the Presidency of Bombay, including Sind, during the year 1889 there were 600,489 births registered against 634,693 in 1888. The recorded births for the year under report are thus 34,204 less than the number registered in the previous year, whilst they exceed the mean of the preceding 10 years ending 1888 by 94,175. Of the births registered 312,974 were males and 287,515 females against 330,316 and 304,377 respectively in 1888.

The following table shows the number of births registered in each year from 1879 to 1889, their ratios per 1,000 of population, and the proportion of males to females:—

Years.	Population.	Number of Births Registered.			Ratio per 1,000 of Population.			In every 100 Births there were		For every 100 Male Births the Females were
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	
1879	16,228,774	151,460	136,410	287,870	9·33	8·41	17·74	52·61	47·39	90·06
1880	16,228,774	195,285	175,588	370,873	12·03	10·82	22·85	52·66	47·34	89·91
1881	16,454,414	239,912	219,745	459,657	14·58	13·35	27·93	52·19	47·81	91·59
1882	16,454,414	255,927	235,419	491,346	15·55	14·31	29·86	52·09	47·91	91·98
1883	16,454,414	261,966	239,835	501,801	15·92	14·58	30·50	52·20	47·80	91·55
1884	16,454,414	278,986	255,737	534,723	16·96	15·54	32·50	52·17	47·83	91·67
1885	16,454,414	298,406	274,025	572,431	18·14	16·65	34·79	52·13	47·87	91·83
1886	16,454,414	303,376	278,177	581,553	18·44	16·90	35·34	52·17	47·83	91·69
1887	16,454,414	327,500	300,693	628,193	19·90	18·27	38·18	52·13	47·87	91·81
1888	16,454,414	330,316	304,377	634,693	20·07	18·50	38·57	52·04	47·96	92·15
Mean for 10 years	16,409,286	264,313	242,001	506,314	16·11	14·75	30·86	52·20	47·80	91·55
1889	16,454,414	312,974	287,515	600,489	19·02	17·47	36·49	52·12	47·88	91·87

The recorded birth-rate for the year is 36·49 against 38·57 in 1888. It is unsatisfactory to notice that no improvement in the registration of births has taken place in several districts, urban and rural.

The number of births recorded in each district in 1889 was lower than in the previous year, whilst it exceeded the mean of the preceding 10 years ending 1888. Of the 24 collectorates, the number of recorded births in 1889 was higher than in 1888 in five only, *viz.*, Sholápur, Bijápur, Broach, Kaira, and Upper Sind Frontier. The remaining collectorates showed a decrease as compared with 1888. In the city of Bombay the registration of births in 1889 appears to have fallen off as the recorded birth-rate for the year was 19·71 against 21·30 in 1888, whilst the mean ratio for the last 10 years ending 1888 amounted to 20·49 per 1,000 of population.

The recorded birth-rates among the urban and rural populations of the Presidency were respectively 27·79 and 37·78 against 28·44 and 40·07 in 1888. Among the rural population of each collectorate, except Ratnágiri, Kánara, Ahmedabad, Karáchi, and Hyderabad, the birth-rates were higher than in the urban circles. In 1888 the birth-rates amongst the rural population were higher than in the urban population in each of the collectorates except Ratnágiri, Kánara, Karáchi, Hyderabad, Thar and Párkar, and Upper Sind Frontier.

Out of 56 towns in the Presidency 14 returned a birth-rate exceeding 40 per 1,000. In many towns, however, the registration of births is still much neglected, particularly in zillah stations, where one would have supposed the wishes of Government would have been more strictly attended to. For example, in the town of Thána a birth-rate of only 7·82 per 1,000 was recorded against 10·51 in 1888, in the town of Násik a birth-rate of 13·85 was registered against 16·72, and in the town of Alibág 21·33

against 21·49 in 1888. In the towns of Poona and Broach the recorded birth-rates were respectively 23·23 and 24·08 per 1,000 against 27·98 and 24·75 in 1888. Birth-rates, such as those of Thána 7·82, Chopda 13·49, Násik 13·85, Kalyán 14·87, and those returned by Nandurbár, Mahád, and Umarkot are absolutely valueless. These and other municipalities, which have returned apparently equally inaccurate birth-rates, cannot be performing their duties properly, and I hope Government will be pleased to call the attention of the authorities to the necessity of much greater attention being paid to this most important subject.

Among the civil population in the rural, town, and cantonment circles in the Presidency, 518,562 deaths were registered during the year 1889. In 1888, 468,039 deaths or 50,523 less than in 1889 were recorded. The following statement shows the number of deaths recorded in each year since 1879 :—

1879	- 387,542	1883	- 420,198	1887	- 455,261
1880	- 328,673	1884	- 408,409	1888	- 468,039
1881	- 381,450	1885	- 473,591	1889	- 518,562
1882	- 343,418	1886	- 381,185		

The year under report, as compared with the previous 10 years, was exceptionally unhealthy.

Of the total deaths registered 270,992 took place among males and 247,570 among females against 243,719 and 224,320 respectively in 1888.

The computed death-rate per 1,000 of population in 1889 was 31·51 against 28·44 in 1888 and a decennial mean of 24·67. Omitting Sind, where registration is very defective, the recorded death-rate in the other parts of the Presidency amounted to 33·06 per 1,000 of population against 30·33 in 1888.

The millesimal ratio of males dying to males living was 31·89 and of females dying to females living 31·11. In 1888 these ratios were respectively 28·68 and 28·19. For every 100 females who died 109·46 deaths among males were recorded, but these proportions varied considerably in some of the collectorates.

The recorded death-rate per 1,000 of population was higher than in 1888 in each of the collectorates except Thána, Kolába, Surat, Kaira, and Ahmedabad. In Broach the recorded death-rate—42·42 per 1,000—during the year was nearly the same as that for 1888, 42·27. In the City of Bombay, Ratnágiri, and Kánara the recorded death-rates were slightly in excess of those for 1888. In the City of Bombay it was 29·81 per 1,000 of population against 28·61 in 1888, in Ratnágiri 18·48 against 17·20, and in Kánara 27·69 against 26·59. It was also higher than the annual mean of the preceding 10 years in all the collectorates except Kánara. In Thána the death-rate, 24·98 per 1,000, was nearly the same as that of the annual mean of the preceding 10 years, 24·43.

In Násik, City of Bombay, Broach, and Ahmedabad, the recorded birth-rate was below the registered death-rate. In Násik they were respectively 38·97 and 45·19 per 1,000 of population. In the City of Bombay the recorded birth-rate was 19·71 and the death-rate 29·81 per 1,000 of population: the difference may be ascribed to defective registration of births. In Broach and Ahmedabad the recorded birth-rates were respectively 37·67 and 34·87 and their death-rates 42·42 and 37·32 per 1,000 of population. In all other collectorates the recorded birth-rates were higher than the registered death-rates.

The mortality amongst infants under one year and children above one year but under five was, as usual, very high in comparison with other periods of life. In fact, the deaths among children under five years of age formed 43·13 per cent. of the total deaths. The period of greatest immunity was in the age of above 10 and under 15, the rate being 7·59 per 1,000. The percentage on total deaths amongst infants under one year is 20·77 against 21·32 in 1888. For those above one and under five the percentage on total deaths is 22·36 against 20·99 in 1888. Among old people of 60 and upwards the percentage on total deaths is 13·44 against 12·99 in 1888.

According to the census of 1881, the Mahomedan population numbered 3,107,171 persons amongst whom, in 1889, 76,596 deaths were recorded against 65,203 in 1888, the death-rate being 24·65 per 1,000 of population against 20·98 in 1888. The Hindu population amounted to 13,128,587 persons, amongst whom 436,178 deaths, or 33·22 per 1,000 of population, were reported during 1889. In 1888 the total deaths amongst this race were 396,887, equal to a death-rate of 30·23 per 1,000 of population. Amongst the Christian population, numbering 138,326 persons, 2,437 deaths were reported during the year against 2,590 in 1888, the death-rate being 17·62 against

18·72 per 1,000 in 1888. Under the heading "Other castes" are included all those not belonging to either of the above sects, who by the census of 1881 numbered 80,330 persons, amongst whom during 1889 there were 3,351 deaths against 3,359 in 1888, the death-rate being 41·72 per 1,000 against 41·81 in 1888. Amongst Mahomedans the maximum rate during the year, 43·07 per 1,000, took place in the collectorate of Násik, and the minimum, 12·46, in Thar and Párkar. In 1888 these results were 38·70 and 10·65 and they were reported as having occurred in Ahmedabad and Upper Sind Frontier. Amongst Hindus the maximum rate, 45·42 per 1,000 in 1889, was in the Násik collectorate, and the minimum, 18·32, in Ratnágiri. In 1888 these rates occurred in Broach and Ratnágiri, 43·57 and 17·03 respectively. The maximum death-rate during the year amongst Christians was 30·40 and was reported from Bijápur collectorate and the minimum 4·51 from Sátára. In the collectorates of Broach, Panch Maháls, Hyderabad, Thar and Párker and Upper Sind Frontier no deaths amongst Christians were reported in 1889.

The subjoined table shows the deaths in 1889, arranged according to the specified causes laid down by the Government of India, and contrasted with the results for 1888 and the mean of the preceding ten years.

Causes of Death.	Mean for 10 Years, 1879–1888.		1888.		1889.	
	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.
Cholera - - -	18,364	1·12	36,496	2·22	32,431	1·97
Small-pox - - -	4,300	0·26	3,617	0·22	7,066	0·43
Fevers - - -	280,175	17·07	304,449	18·50	346,878	21·08
Bowel complaints - -	35,053	2·14	45,462	2·76	48,202	2·93
Injuries - - -	5,916	0·36	5,731	0·35	5,941	0·36
Other causes - - -	60,969	3·72	72,284	4·39	78,044	4·74
All causes - -	404,777	24·67	468,039	28·44	518,562	31·51

The recorded death-rates among the urban and rural population of the Presidency were respectively 33·12 and 31·30 against 31·35 and 28·04 in 1888.

Chief Diseases.

Cholera.

During 1889 cholera caused 32,431 deaths throughout the Presidency or 4,069 less than in the preceding year. The epidemic was severely felt in the Bijápur collectorate, where 3,690 or 5·77 deaths per 1,000 were recorded.

In January cholera broke out in 11 collectorates and caused 496 deaths. In February the disease was present in 9 collectorates, causing 227 deaths, the monthly minimum for the year. In March 895 deaths from cholera were returned from 10 collectorates. In April the disease increased and caused 2,953 deaths. In May it assumed a still greater intensity, and no less than 6,162 deaths were reported from 16 out of the 24 collectorates in the Presidency. In June a fall took place, and 5,202 deaths were reported, but again in July the disease increased as the mortality rose to 6,379, the maximum for the year, and was present more or less in 19 zillás. In August, September, and October it subsided, as the deaths were 5,042, 2,500, and 1,686 respectively. In November and December a still further decline took place and only 375 and 514 deaths were recorded.

In the Bijápur collectorate the death-rate attained the high ratio of 5·77 per 1,000. In Sholápur and Násik there were also high death-rates, namely 4·79 and 4·41 per 1,000, whilst in the Broach, Khándesh, and Dhárwár collectorates the ratios were 3·92, 3·22, and 3·08. The epidemic although widely prevalent did not show any very serious severity in other parts of the Presidency.

Out of the 24,535 villages in the Presidency 2,831 or 11·54 per cent. were affected by cholera. The highest percentage occurred in the Sholápur collectorate, where out of its 709 villages 232 or 32·72 per cent. were affected. In Bijápur and Broach the percentages were 31·69 and 31·01 respectively. In the Surat, Násik, Dhárwár, Sátára, Poona, Ahmednagar and Belgaum districts the percentages were 18·33, 17·18, 16·31,

16·26, 14·90, 14·42, and 12·86 respectively. In the remaining 13 collectorates the rates were below 10 per cent.

Small-pox.

During 1889 there were 7,066 deaths from small-pox—3,616 males and 3,450 females—against 3,617 in 1888 and a decennial mean of 4,300.

In the Sind Registration District small-pox attained a ratio of 0·90 per 1,000 against 0·21 in 1888 and a decennial mean of 0·21. In the Southern Registration District the ratio was 0·53 against 0·05 in the previous year and 0·40 the decennial mean. In the Western Registration District it was 0·42 against 0·44 in the previous year and a decennial mean of 0·39. In the Central and Eastern Gujarát Registration Districts the ratios per 1,000 of population were respectively 0·29 and 0·15 against 0·26 and 0·02 and a decennial mean of 0·20 and 0·10. In collectorates the highest death ratios, 1·94 and 1·12, took place respectively in the Karáchi and Hyderabad collectorates, and the lowest 0·02 took place in the Panch Maháls, the Presidency rate being 0·43 against 0·22 in the previous year and 0·26 decennial mean.

In 1889, 25·32 per cent. of the small-pox deaths occurred among infants under 1 year of age, whilst 49·09 per cent. took place among children over 1 and under 12, the remaining 26·59 per cent. being among persons over 12 years of age.

Fever.

During 1889, 180,451 males and 166,427 females, or a total of 346,878 persons, were reported to have died from fever against 304,449 in 1888, showing an increase of 42,429 for the year, the mean for the previous ten years being 280,175.

In the Eastern Gujarát Registration District fever caused a higher mortality, 27·36 per 1,000, during the year than in 1888, when it was 26·58, the decennial mean being 23·73. In the Western Registration District the death-rate was 20·98 against 17·79 in the previous year, and a decennial mean of 17·14. In the Central Registration District the ratio was 20·04 against 17·63 in 1888, and 16·11 the decennial mean. In the Sind Registration District the ratio was 19·38 against 15·18 in 1888, and the decennial mean of 13·13. In the Southern Registration District the ratio for the year was 17·88 against 15·51 and 15·08 in the previous year and the ten years' mean respectively. In twenty collectorates, out of twenty-four, the fever death-rate was higher than that of the previous year. The collectorate of Broach heads the list with a very high ratio of 33·03 against 31·17 in 1888 and 28·60 in the previous ten years. In the following collectorates high death ratios occurred:—Ahmedabad 30·19, Násik 29·17, Khándesh 27·19, Kaira 26·28, Sholápur 25·63, Ahmednagar 25·44, Surat 23·66, Panch Maháls 22·97, Shikárpur 22·28, and Sátára 22·16, the Presidency ratio being 21·08 against 18·50 in the previous year and 17·07 the decennial mean.

In each month during the year the deaths from fever were both above the mean and corresponding month in 1888. The maximum mortality from fever took place in October, when 32,766 deaths were reported and the minimum in February, when 22,901 deaths were recorded from this cause.

Bowel complaints.

During 1889 bowel complaints caused the deaths of 26,366 males and 21,836 females, or a total of 48,202 persons against 45,462 in 1888, and a decennial mean of 35,053.

The Southern Registration District heads the list with a high ratio of 6·34 against 5·86 in 1888 and 3·73 the decennial mean. The Western Registration District comes next with a ratio of 3·67, the Central Registration District 2·39, the Eastern Gujarát Registration District 1·59, and Sind with a rate of 0·25. In the Presidency the rate was 2·93 against 2·76 in the previous year, and a decennial mean of 2·14. In 12 collectorates the death-rate was higher, and in 11 lower than in 1888, in Hyderabad the rate was the same as that of the previous year. The highest ratios were recorded in Belgaum 8·57 and Dhárwár 7·07, and the lowest in Hyderabad 0·07 and Upper Sind Frontier 0·06.

During the year, excepting December, the deaths from bowel complaints exceeded those in 1888, and the decennial mean. The maximum mortality occurred in August and the minimum in February.

Injuries.

During 1889, 3,386 males and 2,555 females, or a total of 5,941 persons, met with violent deaths. The mortality from those causes is more by 210 than that reported in 1888, when 5,731 deaths were recorded. Of these 5,941 deaths, 2,503 were caused by drowning, 1,751 resulted from snake-bites, 544 from wounds, 193 from hanging, 130 from attacks by wild beasts, 126 from poisoning, and 1,274 from causes not specified. Under drowning, wild beasts, and other causes there was an increase of 256 deaths; whilst under poisoning, hanging, wounding, and snake-bites there was a decrease of 46 deaths as compared with 1888.

Other causes. The recorded deaths from causes other than those specified number 78,044, of which 39,951 occurred among males and 38,093 among females. The total for 1888 was 72,284, for this year there is an increase of 5,760.

Vaccination.

This section has been omitted from this report and will appear separately, *vide* Government Resolution in the General Department, No. 4,357, dated 19th October 1889.

Sanitary Works—Military and Civil.

All available information under these sections has been thrown into tabular forms and will be found in Appendices Nos. III. and IV., as directed in paragraph 5 of Government Resolution No. 3,393, General Department, dated 28th September 1888.

Personal Proceedings and General Remarks.

Drainage, Marine Lines, Bombay.—The sanitary condition of the Marine Lines having been the subject of constant complaint for the last two years, Government were pleased to appoint a Committee of which I was a member to consider and report on the whole question and suggest remedial measures—*vide* Government Resolution in the Public Works Department, No. 192 M. W. 1,385 of 1889. During our first inspection, we found a stoppage between man-holes $\frac{1}{12}$ and $\frac{1}{15}$, the obstruction being mainly due to tree-roots, which penetrated at the joints and had actually broken the sockets of one of the pipes. Below No. 41, Marine Lines, the sewage was almost stagnant and its level in the man-hole was in some cases considerably above the top of the sewer. There was a thick scum on the surface in places and a certain amount of deposit, which increased towards the Queen's Road. This unsatisfactory state of the drains was attributed to defective pumping at Love Grove, where a deposit 4 ft. deep had formed in the main sewer near the outfall.

A rèsume of the recommendations is given in the orders of Government on the report —*vide* Government Resolution No. 299 M. W. 2,035 of 1889—and is as follows:—

(1) The immediate improvement of house drains and their fittings for all the quarters and the completion of the project already sanctioned by Government for flushing and ventilating these drains.

(2) The immediate improvement of the municipal sewer in the Marine Lines, due precautions being taken to deal with tree-roots, &c.

(3) The early and thorough improvements of the Marine Lines' sewer to the sea-outlet which should be maintained in thoroughly efficient order, ample pumping power being provided to meet all contingencies.

(4) The charcoal screens to be removed from the man-holes in the Marine Lines.

(5) Establishment to be provided to carefully look after the house-drains and connexions.

(6) The removal of superfluous vegetation in the Marine Lines and the restriction of future vegetation to lawns or to dwarf shrubs and plants.

(7) The improvement of drainage and water supply arrangements in the new quarters on proposals approved by the Committee.

(8) The removal of present temporary huts in the Marine Lines and the substitution of permanent upper-storied quarters.

(9) The provision of more flushing tanks for sewers and the use of all flushing tanks at least once in the 24 hours.

(10) Experiments to be tried in regard to the ventilation of the sewers.

(11) Arrangements to be made for maintaing a record showing the state of the sewers.

(12) The drainage system should, it is suggested, be completed as soon as possible.

As the drainage of the Marine Lines is necessarily affected by the condition of the general system of drainage in course of being carried out in Bombay, it may not be out of place to mention that hitherto the pipe drains have been laid without a foundation of concrete or any bedding whatever beyond the cuttings of the different soils which they traverse throughout the city. Whether these soils will support the pipes at their proper level permanently is a question of considerable importance. Some of the firmer and harder soils will, no doubt, support the drains, but the ground in Bombay is not uniform in its nature and composition and cannot therefore be expected to bear up the pipes evenly and uniformly for an indefinite period. Then there is the effect of the superincumbent earth and vibration from traffic on the sockets of fragile earthenware pipes unsupported by a proper bedding, the risk of future choking of the drains and its results and the trouble and expenses of replacing the broken portions. I have asserted that it is wrong in principle to lay pipe drains without a concrete foundation and consider I am supported by Mr. Baldwin Latham and Dr. Parkes. The former authority states at page 199 of his Sewerage, 2nd edition, "for, if not properly bedded, "every pipe becomes a girder supported at both ends, and the pipes are liable to failure "from the effect of the weight of the superincumbent earth as was found in some early "sewer works to be the case." At page 275, also, Mr. Baldwin Latham points out the importance of properly bedding pipes, presumably he means concrete foundation, although he mentions an instance of bad soil where wood had to be used under the pipes. Page 276.

It is a well-known fact that the subsoil in Bombay is water-logged for several months of the year and last September the pipe-sewer in the Marine Lines was found in several places submerged in subsoil water.

Dr. Parkes in his Manual of Practical Hygiene, 6th edition, page 366, puts the matter beyond any doubt or question. He says: "Laying of drains: They should be "laid very carefully on concrete in all soils. Sometimes in very loose soils even "piling for the depth of a foot must be used besides the concrete. When pipes are not "laid on a good foundation, leakage is sure to occur sooner or later and the final expense "is far more than the first outlay would have been. The greatest care must be taken in "laying and jointing the pipes and in testing them afterwards to make sure they are "water-tight. In a wet soil a good plan is to have a firm basis or *invert block* which is "itself perforated to carry off subsoil water and to put the drain over this as in the plan "of Messrs. Brooke and Son of Huddersfield." It is unnecessary to add any further remarks beyond recording that the above opinions are unanswerable and conclusive on the subject of laying of drains and that the method adopted in Bombay differs from them inasmuch as the pipe sewers are without concrete foundations.

Unsatisfactory municipal conservancy arrangements.—During the course of my inspection of municipal towns, I have frequently had occasion to remonstrate with several of the municipal authorities regarding the unsatisfactory state of their conservancy arrangements and the paucity of their sweepers. In some instances, the replies to my strictures were that the staff of sweepers and expenditure were as much as could be borne by the municipal income. This led to my looking more closely into the matter, and discovering that large sums of money are yearly spent by municipal bodies on what is termed "road watering" and "road cleaning" establishments, in some cases much in excess of what is for instance expended on conservancy. I do not by any means under-rate, in a sanitary respect, the importance of cleaning and watering roads when not overdone, but I distinctly affirm that these operations are less urgent than those of conservancy and drainage. As a rule, all animal droppings are rapidly removed from the roads by children and women and dried for fuel, leaving little that is offensive for the sweeper's broom, yet a large staff is maintained who constitute in reality a nuisance dangerous to health from the clouds of dust that they raise on the public roads. I should think the removal of the "blinding" from the metal in this manner would prove injurious to the roads, and so induce some one to insist on road scavengers merely removing animal and vegetable refuse. The rapid and thorough removal of nightsoil and sullage from towns is a prime necessity and has the most important bearing on the health of the public, yet some municipal administrations consider the cleanliness of their roads of much greater consequence if one may judge by their returns, which it is hoped, are probably not all accurate in this respect.

Summary of Health Officer's Report.—I submit a summary of the Health Officer of the Port's careful and interesting report.

The following table gives a summary of the shipping and health of the Port, and of the Health Officer's work:—

Vessels including Native Craft.	Number.	Number of Crews and Passengers.	Number of Vessels inspected.	Number of Persons inspected.	Number of Vessels disinfected.	Number of Persons vaccinated.	Diseases.					Equine Disease.	Insanitary Cargo Boats.
							Cholera.	Small-pox.	Measles.	Scarlatina.	Chicken-pox.		
Entered - -	58,599	410,506	26	27,073	14	3,115	4	24	—	6	—	5	—
Left - - -	42,769	407,248	640	78,667	—	—	—	—	—	—	—	—	—
In harbour including population -	1,551	24,887	31	—	31	—	25	4	—	—	3	—	3
Total - -	102,919	842,641	697	105,740	45	3,115	29	28	—	6	3	5	3
1888 - -	105,296	762,863	717	96,757	39	686	51	25	38	—	—	6	—

The following table shows the actual number of ships which arrived with infectious disease on board or before entering the harbour:—

Class of Vessel.	Number of Ships.	Total Number of Crews and Passengers.	Diseases and Number of Cases of each.					
			Cholera.	Small-pox.	Measles.	Scarlatina.	Cattle-disease.	Equine disease.
Troop-ships - - -	2	3,237	—	—	—	6	—	—
Pilgrim ships - - - -	8	7,262	—	23	—	—	—	—
Other vessels - - -	4	*346	4	1	—	—	—	5
Total - - - -	14	10,845	4	24	—	6	—	5
1888 - - -	10	4,759	28	11	37	—	2	4

* Number of crew and passengers of two vessels cannot be given.

The scarlatina cases which occurred on board H.M.'s Indian troop-ships were landed and isolated in the military cantonment at Colába. The eight pilgrim ships which had small-pox on board were placed in quarantine until their decks were thoroughly cleaned up and scrubbed with carbolic acid lotion. They were also fumigated by burning sulphur. Of the 7,262 pilgrims and crew on board these steamers, 3,115 were vaccinated on their arrival at Bombay. Of the four other vessels, the "Mobile" had four deaths during the voyage, and from inquiries on board it is believed that they were due to cholera. Of the remaining vessels there were five suspicious cases of equine disease on board.

The sanitary condition of outward-bound vessels was as a rule satisfactory. The bilges were in a fairly clean condition and there is no record of any deaths caused by mephitic gas poisoning during the year.

Quarantine.—During the year quarantine was imposed against arrivals from Bombay at the following foreign ports and for the period shown:—

At	From	To	Number of days.	Remarks.
Egypt and by infliction at Aden and Perim.	13th January -	15th February	34	Against all arrivals from Bombay.
Aden and Perim - - - -	19th July -	5th October -	79	Do.
	Total - - - - -		113	

Space allowance to pilgrims.—The space allowed by Act X. of 1887 is 9 superficial feet to each adult pilgrim, but this is found insufficient, more especially on the outward voyage when each pilgrim carries as much baggage, both personal and for the purposes

of trade as he possibly can. This personal baggage very often occupies about 20 cubic feet (or about the size of two cotton bales) which the pilgrim will not part with and which causes inconvenience and overcrowding.

Foreshore.—The sanitary state of the foreshore has not improved during the year. The Port Trustees should place more watchmen along the beach to prevent the various bandars and basins from being polluted by nightsoil. The rocky foreshore between Pilot Pier and the Sassoon Dock is used for purposes of nature by the police and is at times offensive. If it cannot be railed in, latrines should be built for the public there.

Victoria Bandar and Basin.—The two latrines at this bandar are indescribably filthy; they discharge into the sea over the wall and the ground all round is polluted and sodden. The latrine accommodation is insufficient and the greater portion of the population resort to the steps, sea wall and wall surrounding the Victoria Basin. The Victoria Boat Basin is an offshoot of the Victoria Basin proper, both of which are exposed at low water. The boat basin is polluted by the inhabitants of this village and surface drain which conveys sullage and nightsoil into it. The basin acts also as a receptacle for the sweepings of the village.

Gun-Carriage Bandar and Basin.—The B. B. and C. I. Railway Company have a latrine at this bandar which is in a very filthy condition. The Colába nightsoil depôt drain discharges into the entrance of the Gun-carriage basin. This nightsoil depôt is the receptacle of all the nightsoil and sewage from that portion of the town between the Wellington Fountain, Apollo Bandar, and the military cantonment at Colába. The nuisance is much greater than formerly owing to the number of houses which have been erected in this district within the last three years.

Arthur Bandar.—This basin is fouled by the drain which opens into the N. W. corner. The drain comes from the Tramway Company's stables and the stench arising from it has been the cause of many complaints from the inhabitants of Grant Buildings.

All the latrines which overhang the sea-wall should be removed and new ones erected in the dockyard and several bandars and connected with the municipal drains. As all the foreshore and basins generally are in a filthy condition, I would suggest that a committee be appointed to inspect them in the early morning and at low water. I would refer to the sketch of a portion of the harbour and foreshore given in my report of last year to show by the graphic method the extent to which fouling is permitted.

ABSTRACT OF REPORT OF THE CALCUTTA MUNICIPALITY FOR 1889-90.

(*Mr. H. Lee, Chairman.*)

Work done and its results.—The knowledge that the approaching census will give us a new set of statistics, for both town and suburbs, very different from our present figures, suggests the desirability of postponing to next year a comparative examination of recent vital statistics. An unusually interesting report will doubtless be then presented to us by our Health Officer. He will then be able to say, with more confidence, what effect the numerous and costly sanitary works that have been carried through since last the census was taken in 1881, have had on the health of the city.

As Dr. Simpson remarks, a most notable event in the year now under review, was the opening of the new pumping station at Halliday Street; and it is satisfactory to find him able to report that "the favourable effect on the cholera-rate of several of the "wards more immediately concerned was soon marked, and has continued throughout "the year."

The total number of deaths from cholera in the city was less than in any previous year but one for the last 18 years; and it will be seen from the figures given by Dr. Simpson in paragraph 6 of his Report that the effect of a pure water-supply in Calcutta has been that the *lowest* annual death returns from cholera recorded before 1869 are almost identically* the same as the *highest* reached since; whilst the highest reached before were more than thrice the highest since.

As regards the better and fuller distribution of filtered water to bustees, which is a subject touched upon by Dr. Simpson as bearing upon our campaign against cholera, it may here be mentioned that a special sub-committee has been recently appointed to consider and report upon the matter.

But, as the Sanitary Commissioner for Bengal has again and again pointed out, the disease to which the most earnest attention of sanitarians in India must be directed, is not cholera, but what is commonly known in its various forms as *fever*.

The Commissioners are thoroughly alive to the fact that to introduce a system of underground drainage without proper means of flushing the drains, will surely lead to the substitution of one form of fever for another: typhoidal for malarial. Accordingly, in the schemes which are now under consideration for the drainage of the amalgamated portions of the suburban area, ample provision is being made for flushing arrangements, and in the year under report, considerable attention was paid to them.

Closely connected with the fever question is the necessity of securing better aeration of the more crowded localities, and in this direction also steady progress is being made. But it is not so rapid as some could wish, for the path is beset with difficulties. The opening up of new roads (amongst which the foremost is, of course, the new Central Road from the Hooghly floating bridge to Sealdah), the setting back of the house line in old streets, the filling up of putrid tanks with non-organic material, are the chief means at the disposal of the Municipal Commissioners, and were none of them neglected during the year.

Of hardly less importance than the consideration of new schemes for saving the air from excessive contamination, and for giving all inhabitants a plentiful supply of pure water, is the necessity of seeing that the best use is made of our existing conservancy establishment and arrangements. In this respect the Commissioners will be glad to have a somewhat fuller report than the present one from the Health Officer next year. No less a sum than Rs. 6,19,882 was spent during the year on his Department, and it is most desirable that he should show at the close of the year clearly, though concisely, just how this money was spent, in what respects well and in what ill.

The largest part of Dr. Simpson's report concerns itself with advocating the introduction of a Building Act into Calcutta. The opinions expressed and the suggestions thrown out, call for the most careful consideration, but it seems doubtful to the

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* The exact figures being 2,270 and 2,272; 6,829 and 2,272.

Commissioners whether he has chosen quite the fittest opportunity to advance the proposal, whilst it would be clearly out of place for them to argue the reasons for and against it in an annual administration report.

Though but few lines are devoted in the Health Officer's Report to the laboratory, the work there done is by no means slight or unimportant. It is a fact not generally known, for instance, that at least once every week the water that is drunk in Calcutta undergoes careful analysis in the Commissioner's laboratory at *three* of its stages. It is analysed as it is taken from the river, it is analysed after being pumped into the first settling tank, and it is analysed as it flows from a tap in Calcutta. The least impurity in the water can scarce escape detection. Similarly, the gas supplied for lighting purposes is regularly and carefully analysed by Dr. Simpson, that it may not fall below the contract standard.

The Commissioners thank Dr. Simpson for the careful note he has prepared on the composition of the milk given by Bengali cows. It appears that the composition of milk is remarkably constant in both tropical and temperate climates, and this fact enables the analyst to employ methods and standards used in other countries and is of much value in enabling him to judge of the results of his work. A useful analysis of buffalo milk is likewise appended.

The facts, figures, and suggestions furnished by the Health Officer under the important head of Conservancy, though somewhat meagre, are interesting. In the way of improvement, the chief work undertaken was the re-organization of the Conservancy Department of the amalgamated area. A full description of the changes effected should find its place in the next year's report.

The Gowkhannah of the old town was well managed throughout the year, and proposals were mooted for opening one or two more such buildings in the suburbs.

The higher standard of cleanliness which is year by year being insisted upon has a clear and sure index in the rapidly increasing number of waggon-loads of refuse despatched to the Salt Water Lakes. In 1889–90 *more than one-third as many again* of such waggon-loads were filled as in the previous year.* Similarly, no less than 33,799 privies were separately served in the old town as against 32,892 of 1888–89.

Towards solving the chief problem that now engages the attention of the Commissioners, which is the proper means of disposing of refuse and garbage, they took the important step of having the two rival incinerators that were recommended to their notice erected on chosen sites for experimental purposes. The experiments will be concluded during the current year. For this reason also the next annual report should be one of special interest.

The Engineer's Report (Appendix B.) seems to the Commissioners to be on the whole extremely satisfactory. It shows how that, in the matter of Water Supply, Calcutta is at last able to take its place in the front rank of the cities of the world; how that no less than 38·53 miles, out of the total of 184·31 miles, which is the present length of pipes conveying filtered water, were laid down during the year under review; and that adequate arrangements were made for greatly extending the length during the current year.

In the Drainage Department sewers and drains were kept in efficient order, whilst much useful new work was done in adding 57 flushing chambers to the 165 that previously existed: in putting down 255 cast-iron manholes and lampholes at (instead of under) the surface of the streets; in laying down kerbstones and channels to the sides of streets in the north and poorer parts of the town; in connecting 685 more premises with sewers (making the total number so connected 25,938); in inspecting premises to the number of 7,019, and correcting defects in them to the number of 3,252; and lastly, but by no means of least importance, in *making surveys for schemes of drainage* for the added area.

The flushing of the sewers was under the charge of the Road Superintendent of the town area and was well attended to, as were the other multifarious and harassing duties of his department. The length of road now in the municipality amounts to 310 miles, of which 92½ miles are metalled with stone, 183 miles with brick, and 34½ remain "*kutcha.*"

The municipal workshop continued to be managed efficiently, and work was turned out to the value of Rs. 1,66,222.

The new Central Road from the Howrah Bridge to Sealdah was begun during the year, and the 1st Section from the bridge to Clive Street was thrown open to traffic on the 28th June 1890.

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* Exact figures were 20,549 against 15,235.

The supervision of the amalgamated area is vested mostly in the suburban improvement committee, which includes all the elected suburban representatives. This the first year of the amalgamation must naturally be more full of promises than works. The area is so great, its wants and capabilities often so widely different, that a new executive and corporation, even with the help of old hands, required some time to understand the situation. The principal works done were the re-organisation and strengthening of the road and conservancy establishments; the gradual taking over of the house-service from the suburban contractor, Ghasi Jemadar, utilising him as an overseer and supplier of sweepers; supplementing the street refuse contract by providing a better staff, and the removal of bustee refuse and providing additional carts departmentally. Plans and estimates were passed for a Gowkhana, after constructing which the Commissioners could enlarge their direct management of the work. The experimental construction of Messrs. Bird & Co.'s refuse incinerator at Gobra with its costly cart-platform was sanctioned.

The Government of Bengal having drawn attention to the want of sufficient latrine accommodation on the Calcutta foreshore, a committee was appointed to inquire into the matter in conjunction with a similar committee appointed by the Port Commissioners, and the result of their deliberation was that the Corporation be recommended to agree to pay the sum of Rs. 2,000 towards the extension of latrine accommodation on the Calcutta foreshore. The recommendation has since been approved by the Commissioners in meeting.

Huts upon filled-up tanks.—With reference to the recommendation of the Health Officer that not less than 10 years be fixed as the period after which huts may be built over tank sites that have been filled up with refuse (Section 247–*e*), the Chairman stated that this question originated from an application by Baboo Gunganarian Pal to build upon tank filled up three years ago, when the Health Officer objected, and said that he considered the lapse of even five or six years insufficient, and was of opinion that 20 years should be the minimum period but proposed as a compromise to fix 10 years. It was contended that no special limit of time should be fixed, that the only sufficient test was to dig deep into the tank, and then if the soil was found suitable, permission should be given, not otherwise. In committee the period was after some discussion fixed at five years, but the Commissioners in general meeting eventually adopted the Health Officer's recommendation, and fixed the limit at not less than 10 years, sanction in each and every case to be given by the General Committee upon a favourable report from the Health Officer.

The laying of filtered water-pipes.—The Committee for considering improvements for the amalgamated area recommended sanction to the estimate of Rs. 1,25,247-12-1 passed by the Suburban Commissioners before the amalgamation, which exceeds by Rs. 25,247-12-1, the amount made over to the said Commissioners, and suggested that the excess amount be met from the money borrowed for the extension of the filtered water-supply. They have also sanctioned in addition the laying of pipes down the Russapugla Road to Jogoo Baboo's Bazar, and the piping of the area bounded on the west by Russapugla Road, on the east by Ballygunge Circular Road, on the north by Lower Circular Road, and on the south by the Puddopooker Road.

Town Improvement.

It will be seen from the Annual Report of 1888–89, that the amount available for bustee and structural improvements for 1889–90 was Rs. 1,98,007-7-10. To this were added during the year contributions amounting to Rs. 2,70,485-2-1. The expenditure actually incurred and adjusted in the accounts has been Rs. 1,30,789-10-3. To this add: Amount spent on special conservancy of bustees Rs. 90,802-11-9. Interest on 5 lakhs already borrowed to improve bustees Rs. 25,000, making a grand total of bustee cleansing and structural expenditure during the year of Rs. 2,46,572-1-2.

Structural Improvements and Subsoil Drainage of Bustees.

The following statement shows at a glance the stages arrived at up to the close of the year in each of the bustees which were being dealt with under the provisions of Sections 280 to 283 of the old Act or Sections 257 to 259 of the new Act.

Improvements completed.

(1) Goa Bagan Bustee and (2) Moonsheetalao Bustee.

Improvements nearly completed.

(1) Baja Bagan Bustee and (2) No. 2 Bonomally Sircar's Street Bustee.

Improvements commenced.

(1) Moydatolee Bustee, (2) Bustee north of Manick Bose's Ghat Street, and (3) Bustee south of Manick Bose's Ghat Street.

Projects finally approved but Works not commenced.

(1.) Machooa Bazar Bustee.
(2.) Mothoor Sen's Foolbagan Bustee.
(3.) Coomertolly Bustee.
(4.) Chinapara Bustee.
(5.) Ahireetola Bustee.
(6.) Maugpara Bustee.
(7.) Hareepara Bustee.
(8.) Hastings Bustees.

Improvements finally considered.

Nundonbagan Bustee (pending in the hands of the engineer).

Cases pending before the Bustee Committee.

(1.) Komedan Bagan Bustee.
(2.) Radha Mullick's Bagan Bustee.
(3.) Narkel Bagan Bustee.
(4.) Chore Bagan Bustee.
(5.) Jorasanko Bustee (improvements abandoned).
(6.) 212, 213, &c., Cornwallis Street.
(7.) Nickareepara Bustee.
(8.) Kripa Nath's Lane Bustee.

Bathing Platforms.—Only two bathing platforms were ordered to be put up, both in Ward No. 2. Possession of the land has since been received from the collector, and works taken in hand. They will be completed and opened to the public during the present year.

Tank filling.—Twenty-one tanks were taken up during the year, of which two were filled up by the owners and six by the Commissioners. Of the remaining number, nine were in process of filling by the department and four by owners.

Town Improvements.—The grant on this account from revenue was Rs. 30,000. This is for petty improvements only. All larger and important constructions are undertaken separately. These improvements are, of course, also independent of all works carried out as bustee improvements. The expenditure incurred on this account, as adjusted during the year, was Rs. 29,302-14-10.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR 1889.

(*Dr. W. J. Simpson.*)

Vital statistics.

The number of births recorded during the year is higher than in any of the previous years. There were 8,752 births against 8,643 and 7,954 in the two preceding years. The birth-rate was equal to 20·2 against 17·9, the mean rate of the decade. It was highest among the mixed races and lowest among Non-Asiatics being respectively 43·3 and 14·9 per 1,000 of the population.

The following death-rates are calculated on the population census of 1881. This basis is not a satisfactory one. All that can be said in its favour, is that it is the best available, for to attempt to estimate the increase to or decrease of the population of Calcutta by the number of births and deaths, and number of inhabited houses which furnish the ordinary data for such calculations in other towns, would be worthless owing to the large fluctuating population of the town. From the census of 1881 it appears "that not more than one-third of the inhabitants of the town and suburbs "were born within their limits, the other two-thirds have immigrated from outside, and "in the majority of cases their residence in the metropolis is only temporary." The census of 1891 must be awaited before it can be determined with anything like accuracy whether the death-rate of Calcutta is over or under-stated. There is this important point always to be remembered that, however favourable the Calcutta death-rate may appear, it really only represents a part of its death-rate and not its real death-rate for Calcutta, being peculiar in having two-thirds of its population merely temporary residents, there are no means of including the death-rate of that large proportion of the population who, unless attacked by an illness which disables them, at once go when sick to their own homes to die.

The number of deaths in 1889 was 11,682 against 11,685 in 1888, and 12,033 the mean of the decennium. The annual death-rate was 26·9 against 27·7, the mean of the decade. While the number of deaths was 11,682; the number of births as previously stated, was 8,752. The deaths have invariably been in excess of the births, so it is perfectly clear that it is not by its own fecundity that Calcutta either increases or remains stationary in population. Burtola is the only ward in which the births are in excess of the deaths. In Burra Bazar the death-rate is four times, in Jorabagan more than three times, and in Colootollah nearly twice the birth-rate.

The mixed races, as usual, exhibit the highest death-rate, dying at the rate of 35·9. Hindoos follow at the rate of 28·4 and Mahomedans at 25·0 per 1,000 of the population. The proportion of females to males was as 34 to 23; the highest mortality occurring among females of "Mixed Races" whose annual death-rate was 40·3 per 1,000.

Fever.

The deaths from fevers are slightly in excess of what they were in the two preceding years, but are still below the other eight years of the decade. The number is 3,341 against 3,674, the mean of the decade. It is almost impossible to determine what diseases are included under this general term "fever." As explained in last year's report all diseases with heat of skin were at one time classed as fevers, the real nature of the disease having never been determined. Year by year as more educated medical men get into practice, this defect will gradually be remedied, and a more reliable record of fevers will be available. That a change is going on will be seen when treating of deaths from "other causes" in which the increase in special diseases may be explained either by the above-mentioned reason, or by new conditions displacing the fevers by diseases of another kind. Probably both causes are in operation.

The deaths from causes other than those included under the distinctive heads of cholera, bowel complaints, fevers, and small-pox amounted to 5,860 against a decennial mean of 5,187. The numbers since 1879 are as follows:— Other causes

1879.	1880.	1881.	1882	1883.	1884.	1885.	1886.	1887.	1888.	1889.
4,345	5,201	5,446	5,349	4,925	5,117	5,463	5,911	5,329	5,685	5,860

The more important diseases which now show a statistical increase are phthisis, pneumonia, and affections of the liver as seen by the subjoined table:—

——	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Phthisis - -	407	361	302	299	444	482	482	540	525	516	536	488	572	667
Pneumonia - - -	47	72	70	75	73	118	97	109	129	105	96	85	134	114
Liver affections -	59	59	59	56	120	172	139	169	291	172	208	322	365	430
Total - -	513	492	421	430	637	772	718	818	945	793	840	875	1,071	1,211

The crowding together of dwellings and the introduction of underground drainage into the narrow and winding lanes of the native portion of the town, may have had something to do with the diseases in question. Underground drainage has undoubtedly had a most beneficial effect on the health and appearance of the town when limited to the more airy portions of Calcutta and to the broader streets, but anywhere else I cannot but express my doubts of its advantage to health.

In connexion with this I shall here quote some recent remarks of Dr. Joubert with reference to the relative value of native and European lives for insurance: "With "regard to point 1, Dr. Joubert remarked that he differed *in toto* from the opinion "expressed by the directors. For some years past I have had frequent opportunities of "seeing the family life of natives of the insuring class, having been frequently called "into consultation at houses in the native parts of Calcutta. I may state in general "terms that in such houses there is an entire absence of all ordinary sanitary arrange-"ments. In almost all houses that I have seen even of the best class, there seems to be "free communication with the sewers, and the smell of sewer gas is to be found in most "of them. In fact, the adoption of underground sewers in Calcutta has introduced "a new element of danger into native houses, and were it not for the open character "of native houses, I am convinced that sewer gas diseases would be more prevalent "even than they are at present. Foul stinking drains in the lower parts of native "houses are the rule."

The opinion expressed by Dr. Joubert is endorsed by the principal and most experienced medical men in Calcutta.

The problem of ventilating the sewers without injury to the public health is difficult enough in the airy quarters of the town, but that difficulty becomes almost an impossibility in the crowded portions of Calcutta with their narrow and winding lanes, and in the most overcrowded portions and in the worst localities; it is my firm conviction that demolition on an extensive scale is the only proper forerunner of underground drainage.

The cholera mortality in 1889 fell below the decennial mean by 572. The number of registered deaths amounted to 1,079 against 1,651, the average number of the decade. Hindoos as usual suffered almost twice as much as Mahomedans, the ratios being 2·7 against 1·9. There were 802 deaths among Hindoos and 247 among Mahomedans. Customs and habits account in a large measure for the differences in the mortality. Pilgrimages, festivals, and the greater use of polluted tanks are important factors in the keeping up and spreading of cholera among the Hindoos, and to these factors, so far as they cannot be common to both races, may be assigned one of the reasons why in the same town two races of people living together should suffer in very different proportions from cholera; Non-Asiatics whose manner of living and sanitary surroundings are usually of a different order were as compared with Hindoos more than four times less liable to cholera. There were eight deaths among Non-Asiatics against 802 among Hindoos. Cholera.

Since the introduction of the water-supply there have been only two years with a smaller number of cholera deaths as will be observed by the following numbers:—

Years.	Deaths.	Years.	Deaths.	Years.	Deaths.	Years.	Deaths.
1865 -	4,243	1872 -	1,102	1878 -	1,338	1884 -	2,272
1866 -	5,990	1873 -	1,105	1879 -	1,186	1885 -	1,603
1867 -	2,270	1874 -	1,245	1880 -	805	1886 -	1,741
1868 -	4,195	1875 -	1,674	1881 -	1,693	1887 -	1,198
1869 -	3,582	1876 -	1,851	1882 -	2,240	1888 -	1,734
1870 -	1,558	1877 -	1,418	1883 -	2,037	1889 -	1,079
1871 -	796						

The years 1871 and 1880 had respectively 800 and 805 deaths. There is a marked periodicity about these low rates from cholera which seems to point to some biological law in the life history of the cholera contagion in the form perhaps of some periodic struggle for existence which when recovered from is followed under favourable conditions for a time with a remarkable vigour. To remove those favourable conditions is practically to stamp out cholera, a consummation which, as far as Calcutta is concerned, will no doubt in time be effected. In the days before the water-supply, *i.e.*, before 1869, there was a similar periodicity only with this difference that the lowest annual number of deaths was 2,270, and the highest over 6,829, whereas after the introduction of the water-supply the lowest was 800 and the highest 2,272.

This year has been a distinguished one in the Calcutta Corporation, because of the bringing into operation the new pumping station at Halliday Street to remedy the scarcity of water felt in the riparian and other wards of the town. Water is now obtainable from every stand-post for 12 hours of the day, and there is abundant pressure where formally it was insufficient. The favourable effect on the cholera rate of several of the wards more immediately concerned was soon marked and has continued throughout the year, the death-rate from cholera, being much reduced this year in the riparian districts. Thus the following wards which benefited chiefly from the water-supply show the subjoined number of deaths from cholera in 1888 and 1889:—

	1888.	1889.
Coomertolly - - - -	170	80
Jora Bagan - - -	293	159
Burrabazar - - - -	76	48
Colootollah - - -	251	142

In connexion with the water-supply, however, there is one matter which needs careful attention and which is deserving of mention. It is this. Though more water is brought into the town now than formerly and is better distributed, yet the distribution requires still to be very much improved before the supply can be said to be wholly satisfactory. Each ward probably has its proper quantity of water provided, but frequently the equal distribution ends there, because much of the supply reaches the better class houses, the occupants of which formerly received as a rule a sufficiency if that supply had not been wasted. More attention should be directed to supplying and distributing the water to the large population living in huts and bustees.

I shall here give an example of a bustee scantily supplied with water, and at the same time record again one of the channels by which cholera spreads in Calcutta. These vary little, year after year repeating themselves so frequently that they become quite familiar, and were it not for the lesson they teach as to the fatal results of uncleanliness the constant allusion to them and their description must appear superfluous. Kristobagan is a good-sized bustee covering an area of over 14 acres, and containing 132 huts with a population of 712 inhabitants. It contains two tanks easy of access, but not a single stand-post. One of these tanks, after being nearly emptied of water, has been photographed, and attached to this report because it illustrates very cleary how the drainage from the huts on the banks of the tank flows into it polluting the water. When the tank was full the drains were not so apparent. There is a bathing platform on the out-skirts of the bustee, but while plenty of water can be obtained from the tank close by, there is not much likelihood of the inhabitants going out of the bustee to provide themselves with purer water. Standing for a short time on the banks of the tank I have seen people washing all kinds of household articles in the pond including the clothing and bedding of sick persons, while at the same moment others quite near to them were filling their *gurrahs* with water for domestic use. No laws of

prohibition will change customs such as these, to which the persons concerned have been brought up from the time of their childhood, unless the conditions which favour the continuance of these habits are changed. These conditions can be changed by providing water stand-posts inside the bustees, and the provision should be ample and constant, and in some relation to the size and population of the bustee.

In Kristobagan there occurred between the 18th of November and the 22nd of December 16 cases of cholera, nine of which proved fatal. The huts in which the cases occurred were mostly within 50 feet of the tank. It began in a child, and most of the other cases seemed to be traceable to contamination of the tank. The cases with the huts in which they occurred are marked in the diagram. On the outbreak being discovered, the inhabitants were warned of the danger of using its water, and a police guard was placed over the tank to prevent them from taking water if they persisted. This measure, however, was not so effective as one would have wished it to have been, for notwithstanding the warnings given, the women would, when the opportunity presented itself, slip down the sides of the tank, fill their *gurrahs* with water and disappear into their houses before the policeman on guard could stop them. If water stand-posts had, however, been within a reasonable distance of their huts, I believe the women would have gone to them in preference. Notices have been issued on the owners to fill up this tank. It is occasionally asked why in some cases is filling up insisted on and in others mere cleansing asked for. The reason is that in many instances, as will be seen by the photograph in Kristobagan tank where filling up is enforced, the huts are so close to the borders of the tank, and the slope and drainage of the ground are such that nothing short of filling up will be an effectual remedy. To cleanse this tank to-day would be to have its water polluted the next, unless every hut around it for a distance of at least 50 feet was removed, and the banks of the tank raised so that the slope of the ground and the drainage would be away from the tank.

While on the subject of water-supply and its distribution I should add that, while pointing out its defects, the Corporation are nevertheless to be congratulated on their due appreciation of the sanitary worth of a pure and abundant water-supply. The extension of the water-supply to the Suburbs has been pushed on with great rapidity, the progress showing a most earnest desire to have the work done thoroughly and well, and to press it forward towards completion as soon as possible, and it must be a source of gratification to all that already those portions of the Suburbs which have been supplied and those portions within reach of the water-supply, have already improved in health owing to this measure.

Small-pox.

It was stated in last year's report that after a respite of nearly two months small-pox was imported into the town towards the close of November 1888 from Patna. "Shookrao," a Mahomedan girl aged 1½ years, arrived at 23, Soortibagan, Ward No. 8, Colootola, from Patna with the disease and died shortly after arrival. In December a case occurred at 14-H-11 Machooa Bazar Street in the same ward, *viz.*, Colootolah, and in close vicinity of 23, Soortibagan, where the first case was imported. In January 1889, a case occurred at 71, Punchanuntolla Lane, Ward No. 9, Moocheepara. It was a carpenter's child aged eight months and was unprotected. From Punchanuntolla the disease spread to No. 5, Harkatta Gully, of the same ward, and not far from the place where the first case occurred, and attacked a boy aged eight years. This boy had some eruptive disease (chicken-pox) in his infancy which his parents considered sufficient to afford protection from small-pox, and so did not get him vaccinated. On receipt of information the rest of the family were vaccinated, but as the disease was incubating in several of them, they contracted it in due course. Those who were previously protected had it in a mild and modified form. This lane is chiefly inhabited by public prostitutes. The best efforts of the department to re-vaccinate them was fruitless, and owing to their refusal to submit to the operation, some of them contracted the disease and not only kept it up there for a long time, but communicated it to the neighbourhood such as Champatolla 2nd Lane, Chooterpara Street, and Ramkanto Mistry's Lane.

About the middle of January a case also occurred at 13-H-31 Nilmadhub Sen's Lane, Colootola ward. The man was a native of Burdwan and was unprotected. On his death attempts were made to revaccinate the rest of the family, but they were of no avail, and the result was that his younger brother contracted the disease and also died from it.

In the beginning of February several cases occurred in different parts of Colootolah and Moocheepara wards, and individual cases also cropped up at Shampooker, Kumartoollee, and Sukea's Street wards. In March the disease not only continued in the above wards of the northern division of the town, but spread to the Puddopooker

and Fenwick Bazar sections of the southern division. In April and May the disease continued unabated in Shampooker, Kumartolly, Sukea's Street, Colootolah, Moocheepara wards, and cases occurred for the first time in Jorabagan and Jorasanko sections. In June, however, the disease declined, and from this month up to October, cases occasionally cropped up here and there. In some instances, the persons attacked came into the town, while the disease was incubating in them and shewed itself immediately after their arrival.

But although the disease declined or almost disappeared from the town, it made its appearance in the southern suburbs. It was in August that the disease made its appearance at Matiabrooz. A servant and a maid-servant's boy in a Mahomedan family were attacked with small-pox. From them four other persons were attacked, of whom three died. None of them were protected. Later on the disease became very prevalent in the surrounding villages. The persons attacked were the tailors and washermen at Garden Reach. Many of the former were in the service of European families in town, and also did work under contract for many dressing shop-keepers in Chandney and China Bazar, and undoubtedly helped to spread the disease in Calcutta.

After a clear pause of three or four months small-pox broke out at Jorabagan ward towards the end of October in the Jorabagan bustee. Nitymoni Raur a prostitute residing at 16, Jorabagan Street, was first attacked; she was unprotected. This is a crowded bustee inhabited chiefly by prostitutes, day labourers, and lower classes of up-country people. The disease rapidly spread amongst these, and notwithstanding the precautionary measures that were taken as regards vaccination and disinfection, the floating nature of the population and the reluctance of the people to give information of the occurrence of the disease, materially helped to keep it up in this locality during the subsequent months. In November the disease spread from Jorabagan to Durponarain Tagore's Street and Rutton Sircar's Garden Street, and from these latter localities, it spread in December to Daccaputty, Shibtolla Lane, and Shib Thakoor's Lane. In November the disease appeared in Shampooker and Kumartolly wards. The first case in the latter ward contracted the disease in Jorabagan while living in a prostitute's house, and subsequently went to his father-in-law's house at No. 4, Gullock Dutt's Street, where he died. The second case occurred at No. 1, Mothoor Sen's Garden Street, in close vicinity of Jorabagan bustee. The first case in the Shampooker ward occurred towards the close of November at 29, Doorga Churn Mookerjee's Street. This man was a native of Midnapur and was unprotected. No direct source of contagion could be traced in this case. From Dooga Churn Mookerjee's Street the disease spread in December to Hurro Lall Mitter's Lane and Gopee Mohun Dutt's Lane.

It was towards the close of December that the disease occurred at Hurry Ghose's Street, Bertolla ward. In December cases also occurred in Colootolah and Taltolla wards of the town and in Balligunge and Alipore wards of the amalgamated area.

When, in February 1889, the disease occurred in several wards of the town and threatened to assume an epidemic form, I thought it necessary to give a warning of this in the principal newspapers of the town and advised the residents not only to get their unprotected children vaccinated, but to have those re-vaccinated who were vaccinated years ago. The services of the Medical Inspectors were placed at the disposal of the Deputy Superintendent of Vaccination to help in a house-to-house visitation in the affected districts and to discover if there were other unknown cases, and vaccination and re-vaccination were rigourously carried on around the centres of contagion. The houses in which the disease occurred were in all cases disinfected and fumigated, and the beddings and clothings of the affected were destroyed under the personal supervision of the Medical Inspectors. These measures kept the disease under control and prevented it from assuming an epidemic form.

Vaccination. The total number vaccinated during the year 1889 amounted to 15,941. Of this number 11,800 were in the town and 4,141 in the amalgamated area against 10,584 in the town last year. Of the total number vaccinated 12,543 were primary and 3,389 were re-vaccinations. Of the 12,543 primary vaccinations 11,053 were successful, 696 were unsuccessful, and the result was not ascertained in 794 cases. The rate of success in primary vaccinations calculated on the ascertained successful cases was 88·12. Of the 3,398 re-vaccinations 615 were successful, 1,499 were unsuccessful, and in 1,284 cases the result was not ascertained. The rate of success in re-vaccinations was 18·09. The rate of success in primary and re-vaccinations last year was 84·63 and 11·32 respectively.

In Calcutta both the humanised and animal virus was kept up by regular transmission and used all the year round. With the station system of vaccination, the difficulty of

procuring humanised lymph is increasing every year, so that the calf lymph is not only used in the vaccine stations, but is freely used in home vaccinations; also the prejudices against its use amongst the native community are dying fast away.

Vaccination is systematically carried on in all the sections of the town and amalgamated area, but the degree of protection in each ward varies with the nature of its population. The wards inhabited by European and resident Bengalees are better protected than those inhabited by up-country people. The Vaccination Act has been of great help in dealing with the prejudices of these up-country people, and scarcely a year passes in which vaccination is not introduced in some new families amongst the Khetrees and Marwarees.

As usual the Vaccination Act was systematically carried out during the year under report. The vaccinators made regular house-to-house inquiry in their respective wards, and where unprotected children over 1 year were found, notices were served on their parents or guardians to have them vaccinated within 15 days. In this way upwards of 2,000 notices were served during the year. Most of these people complied with the law on the receipt of the notice, but 177 had to be prosecuted for neglect to do so. The Registrars of Births also submitted monthly statements, giving the names of 6,767 persons, who failed to produce the statutory certificates of having had their children vaccinated. All these cases were inquired into by the department with the following results:—4,317 were traced and vaccinated, 926 were found to have left town, 313 could not be traced, 454 were dead, 492 were ill, 3 had natural small-pox, and 262 were prosecuted and vaccinated by order of the magistrates.

Besides the above prosecutions, 235 were prosecuted for neglect of inspection, so that the total number of prosecutions under all heads amounted to 674 against 1,099 in the previous year. The decrease is due to the prevalence of small-pox nearly all the year round.

Vital Statistics of the Amalgamated Area.

There were 3,565 births in 1889, giving a birth-rate of 2·12 against 3,361 in 1888, equal to a birth-rate of 20·0.

There were 7,882 deaths registered in 1889 which is estimated to be equal to a death-rate of about 46·9 per annum per 1,000 of the population against 7,985 in 1888. Such great changes, however, have taken place in the population of the several wards since the last census that one is not at all certain whether 46 per 1,000 is too high or too low as a death-rate. Kidderpore and Watgunge have had their population disturbed by the great clearance for the docks. The number of deaths from the principal causes were—

Bowel complaints	1,425
Cholera	1,236
Small-pox	28
Fevers	2,653
Other causes	2,540

while during the past four years the deaths were as follows:—

Statement of Deaths from Principal Diseases in the Amalgamated Area of Suburbs during the past four years.

Years.	Cholera.	Small-pox.	Fever.	Bowel Complaints.	All other Causes.	Total.
1885	1,265	39	2,389	1,509	2,302	7,504
1886	1,031	9	2,107	1,104	2,134	6,385
1887	1,560	5	2,308	1,292	2,440	7,605
1888	1,504	11	1,337	1,629	2,504	7,985

ABSTRACT OF REPORT OF THE MADRAS MUNICIPALITY FOR 1889–90.

(Lieutenant-Colonel G. M. J. Moore, President.)

Black Town Drainage—Pumping Station.—An estimate amounting to Rs. 3,966, for an additional room to the Pumping Station at Royapuram, for accommodating a new engine was sanctioned in May 1889. The room was so far completed in January last that machinery was being fitted up in it, and the flooring and some plastering remain to be executed. This can only be done when the fitting up of the machinery is finished.

Sewer No. 2.—Mr. C. A. Smith, the late acting Vice-President, completed the examination of the sewer, and submitted the following report on the 24th May 1889 :—

"I have the honour to forward herewith a tabular statement [not reprinted] of the results of my examination of No. 2 sewer and to report as follows on its present condition.

"2. Shortly after Colonel Pennycuick's examination of the sewer in 1886, No. 1 manhole in Old Jail Street was blocked with planks and clay and the same had previously been done with Nos. 21 and 22 opposite the Arrack Distillery. On October 10th, 1888, I examined the manholes along Old Jail Street with you and they were evidently full of water up to sub-soil water level.

"3. On 16th January on opening No. 1 manhole it was found that the blocking had given way and that the sewer was therefore connected with the Royapuram Pumping Station.

"4. It is not known when the blocking gave way nor how long the pumps had been drawing on the sewer, but it must have been after October 10th. On 17th January an attempt was made early in the morning when the sewage was low, to examine some parts of the sewer and a man went through between manholes 10 and 11 and reported four leaks from the crown, but it was found that there was too much water to examine it properly and this manhole (No. 1) was again blocked at 6.30 a.m., and at 8.40 the depth of water in No. 3 manhole was 6 ft. 11 in., the depth before blocking having been 1 ft. 9 in. At 5.40 p.m., the 2-horse power engine and 4 in. pump was started at manhole No. 6, the depth of water in No. 5 being 7 ft. 4 in. and in half-an-hour the level was reduced by 1 ft. 7 in. and the pump was then stopped.

"5. On 18th January pumping was again started at 2.45 a.m., and at 6 a.m. after 3¼ hours pumping the water was only reduced by 2 ft. 2 in. The pump being evidently not powerful enough was stopped at 7.20 a.m.

"6. On 21st January the same engine and pump was started at No. 23, and the water in the sewer from 23 to 46 pumped out. On examining the manholes above No. 23 there appeared to be leakage between 38 and 39 and to cut this off, No. 38 was also blocked with planks and clay at 12.33 p.m. On 22nd January the blocking in No. 1 manhole was again removed and a further attempt made to examine the sewer between the Broadway and the Arrack Distillery, but there was too much water and it became evident that the only way would be to examine in sections. No. 1 manhole was, therefore, blocked again and left for the time.

"7. On 24th and 25th January, the sewer was examined from 23 to 26. The pump was then removed to 26 and on 26th January from 26 to 30 was examined.

"8. On 30th January between Nos. 30 and 32 and 34 and 37 was examined with the small engine still working at No. 26.

"9. On 31st January, the blocking was removed from No. 38 the small engine worked at 26 and the No. 8 Pulsometer at No. 39 and between 32 and 34 and 39 and 43 was examined.

"10. On 1st, 4th, and 5th February with the Pulsometer working at No. 39 from 43 to 58 was examined.

"11. On 15th February 14 and 15 were blocked, 21 and 22 having also been previously blocked the Pulsometer worked at 17 and 2-horse power at 20 but could not reduce the water sufficiently, so were stopped after an hour's work.

"12. On 26th February between 22 and 23 was examined, and to effect this Nos. 24 and 25, 19 and 21 were blocked and the small pump worked at 23.

"13. On 27th February between 21 and 22 was examined, Nos. 19, 20, 23, 24, and 25 being blocked and the small pump working at 22.

"14. On 28th February between 20 and 21 was examined, Nos. 18, 19, 23, 24, and 25 being blocked and the small pump working at 20.

"15. On 1st and 2nd March between 17 and 20 was examined, Nos. 16, 21, 23, and 24 being blocked, the small pump working at 20 and the pulsometer at 17. This length took two days to finish on account of a quantity of refuse from the Arrack Distillery which had been allowed to flow into the sewer.

"16. On 4th March between Nos. 16 and 17 was examined, Nos. 14, 18, and 19 being blocked and pulsometer working at No. 17.

"17. On 6th March between Nos. 14 and 16 was examined, Nos. 12, 13, 17, and 18 being blocked and 2-horse power engine working at 14.

"18. On 8th March, 2-horse power worked at No. 10 but could not lower water sufficiently either between 17 and 9 or between 9 and 12.

"19. On 12th March, with Nos. 8, 9, 17, and 18 blocked and an 8-horse power engine and 8 in. pump working at No. 10, an attempt was made to examine between 10 and 14, but there was evidently considerable leakage, and as the pump could not lower the water in the sewer to less than about 1 foot on account of its not being able to draw below that level, it was not possible to get inside the sewer.

"20. On 15th and 16th March Nos. 6, 7, 17, and 18 were blocked, an 8-horse power engine and 8 in. pump worked at No. 8, the 2-horse power pump at No. 11 and the pulsometer at No. 12, and between 11 and 14 was examined. The 8-horse power engine alone would have been more than sufficient to pump out the sewer, but as when the water falls below 1 foot in the sewer the pump fails, and as the water was found to rise rapidly as soon as the pump stopped, the other two pumps were kept ready to supplement the large one in order that there might be no risk of the water rising while anyone was inside the sewer.

"21. On 18th March No. 5 was blocked and the blocking in No. 1 removed and an attempt was made to examine between No. 5 and the junction well, but the water not being low enough nothing could be done.

"22. On 25th March Nos. 5, 6, 7, 17, and 18 being blocked, the 8-horse power engine and 8 in. pump worked at No. 8, the pulsometer at No. 9 and 2-horse power at No. 10, but although the water could be reduced to about 1 foot in the sewer it was not considered safe to send a man inside. The upper side of No. 9 was then blocked by means of a wooden disc and it was settled to examine the remainder of the sewer by pumping in the junction well.

"23. To do this, it was necessary to get rid of the sewage passing through the well from No. 1 sewer, so a sheet iron tube was made to connect No. 1 sewer with that portion of No. 1 sewer below the well and this was fixed in position on 29th March.

"24. On 1st and 2nd April the sewer was examined from the well to No. 4 manhole, No. 5 being blocked and the 8-horse power engine working at the well.

"25. On 2nd and 4th from 4 to 9 was examined, the sewer on the upper side of No. 9 being still blocked with the wooden disc.

"26. On the fourth afternoon this disc was removed and it was intended to make a final attempt to examine between Nos. 9 and 11. For this purpose the 8-horse power engine and pump were started at 1 a.m., on 6th April, but at daybreak it was found that at the place between 11 and 12, where leakage was known to exist, some of the earth above the sewer had fallen in and therefore the pump was at once stopped. This sinking was, undoubtedly, due to the pumping and could the leak have been reached earlier might probably have been prevented.

"27. Arrangements are being made to open out and examine the sewer at this place and when this is done a further report will be made.

"28. It will be seen from the detailed report that above No. 12, with the exception of a few leaks between 19 and 22, which I hope to be able to stop effectually from inside, the sewer may be said to be sound.

"29. Between 10 and 12, 8 and 9, 5, 6, and 1 and 2 some portions will, I am afraid, have to be rebuilt, but to what extent can only be definitely reported after opening out the sewer.

"30. The state of the sewer between 9 and 11 cannot be ascertained at present, but it may be possible to do so after opening out the collapsed portion between 11 and 12.

It will also be seen from the report that some of the original leaks which are probably those referred to, in progress report for April and May 1886, could not have been permanently stopped, and probably most of the present leaks through the blocks are old ones which have broken out again. No record appears to have been kept of the leaks which were stopped, but if the above supposition is correct, it tends to show that if the now existing leaks can be stopped, the sewer can be made sound.

"31. The result of the examination has been given in great detail and a great many of the points noted are of little or no importance, but it was thought better to mention everything exactly as it was reported.

"32. The whole of the examination has been carried out under my personal supervision and, as will be seen from the detailed statement, I have been through some of the doubtful lengths myself. I have no reason to doubt the accuracy of the statements made with regard to the remaining portions. It was seen from the beginning of my examination that there was leakage which had no doubt been started and aggravated by the sewer having been connected with the Royapuram Pumping Station by the washing out of the blocking in No. 1 manhole.

"33. For this reason endeavours have been made to examine the sewer, in as short lengths as possible, in order to avoid increasing the leakage by constant pumping. The natural result has been that the cost of examination has been considerably increased on account of more pumps having been required as well as constant shifting of machinery and blocking and unblocking of manholes.

"34. In addition to blocking the manholes, above and below the particular section under examination, adjustable wooden discs were used at times to still further reduce the length to be pumped out.

"35. The above report was ready on April 16th, but was deferred until the result of opening out the sewer between manholes 11 and 12 had been ascertained, the opening out was commenced on 16th April, but I regret to say that the cause of the sinking of the earth was only ascertained on May 23rd.

"36. I began by taking the course which I was informed had been successfully followed on two previous similar occasions, *i.e.*, to have the water for the excavation by pumping from a separate shaft or well about 25 feet away from the trench and not directly connected with it, but although the shaft was sunk considerably below the level of the sewer, it had not sufficient effect on the water in the trench, and it was therefore found necessary to make a direct connexion. Great difficulty was found in making the connexion owing to the nature of the sub-soil which was constantly running in from behind the planking necessitating continual watching and great care to avoid any slipping of the timbering.

"37. On the above account it was several times necessary to stop work in the trench until the timbering had been made secure, and in spite of all efforts it was not possible to get down to the sewer till the 18th instant. At that time the pumps (No. 8 pulsometer in well, two No. 5 pulsometers in trench, and the 2-horse power pump in manhole No. 12) were not powerful enough to reduce the water in the trench sufficiently, and on 20th instant a No. 9 pulsometer was worked in the well and a No. 8 in the trench besides the 2-horse power pump working in No. 12 manhole. Even this was insufficient to reduce the water below 1 foot above sill of sewer, but having ascertained the nature of the leak by feeling with the hand a hole was cut in the top of the sewer on 23rd instant to ascertain its exact extent.

"38. I am glad to say that the sewer had not given way as I had expected, but a leak which originated in the joint between two blocks has by the action of the sand carried into the sewer from outside been gradually increased until the blocks from the outside as far as the centre of the invert have been scoured away till the joint is about 3 in. wide and the brickwork from the springing has also been scoured away for a width of about 7 in., a height of 1 ft. 3 in. and a depth varying from 7 in. at the springing to 2 in. at the top. The actual area of the leak into the sewer is about 18 in. by 2 in. This hole was found at 55 ft. from No. 11 manhole, the exact spot at which the earth had sunk, and the sewer has sunk 3 in. at this point owing to the sand having been drawn inside from underneath it. There is also a small horizontal crack about 6 ft. in length in the side of the sewer. There are also two more leaks in the invert joints close by this, but their exact dimensions could not be ascertained. The surki concrete laid under the sewer does not appear to have set at all, no doubt owing to the surki mortar having been washed out of it by the running water before it had time to set.

"39. After your inspection of the sewer on 24th instant, orders were given to close up the gap cut in the sewer with brickwork in cement to prevent the sand from above sinking into it and to fill up the excavation.

"40. I regret that I am unable to give a more satisfactory account of the present state of the sewer. As I have stated above, it will be necessary to rebuild in portions, and if it is possible to stop the leaks in the block joints from inside. I think the re-construction of these portions should be in masonry, the design being modified and strengthened to suit the circumstances. I cannot recommend much expenditure on the existing sewer, but would suggest that some attempts be made to stop the leaks from inside, and if these attempts fail I can see no other course open, but to relay the sewer wherever leaks exist, and the question then to be decided will be whether to rebuild in masonry or to use iron pipes. Of these two courses I should have no hesitation in recommending the latter were it not for the fact that the pipe from the Fort Pumping Station, which has been in use about 12 years, has undoubtedly been to some extent corroded by the sewage passing through it. Another fact is that Seven Wells water in which the pipes would have to be laid, has also a considerable corroding action on iron. On the whole, I doubt if the action in either case is sufficiently rapid to prevent the use of pipes, but the point requires consideration."

PRESIDENT'S INDORSEMENT THEREON, dated the 28th May 1889.

"The above report on the examination of No. 2 sewer is forwarded for information of the Commissioners.

"There is no doubt that from manhole No. 12 to the well, the sewer will have to be rebuilt in more than one place, certainly short lengths between 1 and 2, 5 and 6, 8 and 9, 10 and 11, 11 and 12. The exact lengths cannot be stated. Above 12 to the commencement of the pipe sewer (manhole No. 31) it is believed the sewer can be made water-tight from inside.

"It is for the Commissioners to decide whether the present sewer from manhole No. 12 to the well shall be abandoned and a new pipe sewer be substituted or whether any attempt should be made to make that portion sound. Whether it can or cannot be made sound can only be determined by experience."

The report was laid before the Commissioners at an adjourned special meeting held on the 28th June 1889, at which it was resolved "that Government be respectfully "requested to appoint a committee of their engineer officers to inspect and examine the "Black Town Drainage Works, and especially sewer No. 2, and to submit their report "in detail." In G.O., No. 2294W., dated the 21st August 1889, Local and Municipal, Government appointed a committee to report on the Black Town Drainage Works. The committee was composed of the following officers :—

(1.) Mr. G. T. Walch, Mem. Inst. C.E., Ag. Chief Engineer for Irrigation.

(2.) Lieut. Col. R. R. E. Drake-Brockman, R.E., Ag. Chief Engineer, General Buildings and Road Branch.

(3.) Mr. J. A. Jones, Mem. Inst. C.E., Municipal Engineer.

The Committee met at the Municipal Office on the 15th October 1889 and submitted the following report which was communicated to the Commissioners in G.O., dated the 12th November 1889, No. 1523M., Local and Municipal :—

"As regards the state of the sewer, it is impossible for the Committee to add anything to the very careful detailed report after personal examination made by Mr. C. A. Smith, which was discussed at the adjourned special meeting, of 28th June 1889, of the Municipal Commission, on which the Government Order appointing the Committee was issued. On that report, therefore, and a consideration of plans, sections, and information obtained at the Municipal Office, the Committee bases the following recommendations, and it is of opinion that if they be carried out, there is every reason to expect that the sewer will be rendered efficient and may be brought into use without fear of any evil results.

"The recommendations are :—

"(1st) To remove the faulty portions of the existing sewer and rebuild them between the under-mentioned points, *viz.* :—

Between Manholes.	From	To	*Length.	Remarks.
	Feet.	Feet.	Feet.	
1 and 2	103	116	13	* These lengths are approximate.
5 and 6	48	Manhole No. 6	55	
8 and 9	0	20	20	
11 and 12	Manhole 8 / Manhole 11	Manhole 12	187	This portion is in the worst order, and is the most difficult to deal with.
			275	

"(2nd) To deal with the leaks in the other places (which according to Mr. Smith's report are unimportant) by means of special local treatment adapted to the various conditions of the cases.

"In rebuilding, no ordinary 'lime-mortar' or 'surki-mortar' should be used, but Portland cement with no greater proportion of sand than 1 to 1. All *brickwork* should be of specially-moulded bricks gauged to suit the curvature of the rings, so that the joints may be of uniform thickness throughout. *Internal plastering* should be composed of two coats ; the first consisting of one part of Portland cement and one sand, and the second of pure Portland cement. *External plastering* should be of one coat composed of one Portland cement and one sand. When refilling the excavation trench, clay puddle should be used to a height of 1 ft. 6 in. above top of sewer.

"The work proposed is of a high class and therefore expensive, on account of the large amount of sub-soil water which it has been found will be encountered at the place where the rebuilding is recommended.

"The accompanying data furnished from the Municipal Engineer's office show that the cost of the rebuilding herein recommended will be about Rs. 5,260 exclusive of excavation, removing old work, and refilling, which are set down at about Rs. 11,010."

In connection with this report, the re-construction of sewer No. 2 between manholes Nos. 11 and 12 was commenced in March 1890.

Water supply.

On the 1st April 1889, the level of the Red Hills Lake stood at 41·19 and at 41·27 on the 31st March 1890. During the year, the level fell to 36·47, when it became necessary to arrange for pumping. Machinery for this purpose was sent to the Red Hills, and erected, and everything was in readiness to begin pumping, in case the level of the tank should fall to 35·31. Timely rainfall, however, saved further expenditure on this head. The quantity of water supplied to the City during 1889–90, was 310,528,891 cubic feet, or 18 gallons per head, for an estimated population of 300,000 within the water-supply area. In the previous year the quantity supplied was 333,878,262 cubic feet. The decrease is probably due to the deterrent effect of the meters generally, greater care being taken to prevent wastage. The water from the Red Hills Lake was shown by analysis to be worse this year, than it was last year. This was no doubt due to the continued drainage of the villages into the lake from the western and northern slopes, and unless these villages are removed the quality of the water will continue to be impure.

Vaccination.

The total number of cases vaccinated during the year 1889–90 was 24,502 as against 23,573 in 1888–89. Out of the 24,502 cases, 23,504 proved successful, 538 unsuccessful, and the results in 460 cases were not known, as most of them were among convicts vaccinated at the Penitentiary and subsequently transferred to other jails.

The following is a comparative statement of the results of 1888–89 and 1889–90, showing an increase of 929 cases over that of the previous year. The increase was mainly due to the satisfactory manner in which the unprotected children among the fishermen in the Cassimode and Tondiarpet Cooppums were operated on during the latter part of the year.

Year.	Total vaccinated.	Compared with the preceding Year.		Successfully vaccinated.	Percentage of success.
		Increase.	Decrease.		
1888–89 - -	23,573	—	—	22,741	96·4
1889–90 - -	24,502	929	—	23,504	95·92

The percentage of successful cases during the year was 95·92 as against 96·4 in 1888–89, and while there has been an increase in the total number of cases vaccinated, there has been a slight fall in the percentage of success, due to a little increase in the number of unsuccessful and unknown cases over that of the preceding year.

There are eight vaccine depôts where vaccination is carried on free of charge. In two of these, lymph charged in tubes was used, but this was discontinued in December 1889, and now in all the eight vaccine depôts children are being vaccinated with lymph taken direct from calves. From June 1889 tri-weekly vaccination was substituted for daily vaccination. The two depôts (at the Municipal Office and Chetpet) were closed in May 1889, and in their stead depôts at Egmore and Thousand Lights were opened from June 1889. For these depôts the Municipality is indebted to the liberality of Lady Ramasawmy Mudaliar.

Out of 24,502 cases vaccinated, 13,281 were males and 11,221 females; 1,016 were Europeans, East Indians, and Native Christians, 2,068 were Mahomedans, and 21,418 were Hindus.

Out of 24,502 cases, 22,779 were primary and 2,713 were re-vaccinations. Of the 22,779 primary vaccinations, 22,100, or a percentage of 97·01, were successful as against 97·46 in 1888–89. The percentage of successful vaccination among cases of primary vaccination was higher than among cases of re-vaccination.

The number of infants vaccinated under one year of age was 15,620 as against 15,588 in 1888-89, showing a small increase of 32 cases. Of these, 15,243, or a percentage of 97·58, were successful. During the past three years, the largest number of cases vaccinated was among children under one year. Of 24,502 cases vaccinated, 15,620 were infants under one year, 5,434 above one and under six years, and 3,448 above six years.

Of the total births registered during 1889–90, 438 were returned as still-born. There were 5,567 deaths under one year from various causes. It will, therefore, be seen that the number of infants vaccinated (15,620) is greatly in excess of the births, for all the infants operated on were not born in Madras. In some cases mothers go up-country for confinement and return to Madras, and in others mothers from up-country come down to Madras and go away to their native lands after confinement. Infants of temporary residence escaped vaccination as the mothers return to their houses within 6 months before vaccination can be made compulsory on them.

The following table shows that for every 100 of population, 6·14 resort to vaccination. A large proportion of the Hindus are being vaccinated year after year; 6·90 per 100 of that class were vaccinated against 2·59 among Christians and 4·18 among Mahomedans in 1889–90.

——	Europeans, East Indians, and Native Christians.	Mahomedans.	Hindus.	Total.
Under one year - - -	661	1,442	13,517	15,620
Above one and under six years -	257	475	4,702	5,434
Above six years - - -	98	151	3,199	3,448
Total - - - -	1,016	2,068	21,418	24,502
Population - - -	30,094	49,404	310,279	398,777
Percentage of vaccination to population.	2·59	4·18	6·90	6·14

A very few of the people in Madras resort to depôts to get their children vaccinated after six months of age on the receipt of notice served on them, but most of them put

off vaccination until summonses are taken out and served on them by the police. To avoid appearance in the court, the people rush to depôts with their children for vaccination on the day of hearing, when the prosecutions are generally withdrawn. The Lubbays are another set of people who, like the fishermen, resist vaccination, but it is hoped that this difficulty will be overcome in course of time.

Vital statistics.

Births.—During the year under review no less than 16,349 births exclusive of still-born were registered, against 15,980 reported in the previous year, showing a ratio of 40·9 against 40·0 per 1,000 of population. The average of the past decade amounts to 15,957·2 and is less than the number of births during the year by 391·8. The number of still-births during the year amounted to 385, against 488 in the previous year, and 398·7 the average of the decade.

The birth-rate among all the classes was greater during the year under review than in the previous year, and the increase is more striking among the Christians, with a birth-rate of 36·7 against 32·8 in the preceding year. The fecundity during the year among this class was greater than among the other sections of the population, taking into consideration the proportion in which the birth-rates increased under each class from what they had been in the previous year. The increase in the number of births among the Mussulmans was only 20, or by a ratio of 0·3 per 1,000, and among the Hindus it was 197 or by a ratio of 0·7 per 1,000 of their class.

The birth-rate of Madras is nearly double the birth-rates of the towns of Calcutta and Bombay. In 1888 the birth-rate of Calcutta was 19·9 per 1,000 of population, against 17·4 the average of the previous ten years. The Health Officer of Bombay states in his report for the year 1888, that the birth-rate of the city was 21·67 and it was with one exception the highest recorded in any one year. The probable cause of this higher birth-rate in Madras was explained in the report for 1886, paragraph 215. It can hardly be traced to imperfect or erroneous registration, for every birth registered on a certain day is verified without any difficulty even after six months by the Vaccination Department under the vaccine byelaws.

Mortality.—The total number of deaths during the year was 17,086 against 15,439 of the previous year, giving a ratio of 42·8 against 38·7 per 1,000 of population. The average rate of mortality in the past decade had been 39·0. The general mortality for the year, therefore, compared unfavourably both with that of the previous year and the mean of the decennium. The figures under each disease for the year under report, except those returned under cholera and "other causes," are higher than those of the previous year. But the immediate cause for the high general mortality of 1889 was the epidemic prevalence of "measles" which proved fatal by itself and by its complications amongst children who were attacked. More will be said on this subject when dealing with the disease.

The year commenced with a high mortality of 1,682 deaths in January. In the next month there was a sudden fall with gradual risings in the succeeding months till June and July were reached when again there was a diminution in the mortality which continued till November. But in the following month the number of deaths suddenly increased. Except the figures of November and December, those of the remaining months of the year under report are higher than those of the corresponding months of the previous year. The largest number of deaths occurred in January and the least in November, and it is also to be noted that the month which registered the largest number of births recorded the least number of deaths. If the number of births for February is set aside as recording the births during the twenty-eight days of that month, January comes next in having registered fewest births and it is seen that during that month the mortality was at the highest.

As in the previous year the mortality amongst the Mussulmans was the largest, next the Hindus, and lastly the Christians. If the death-rates are compared with those of the previous year, the increase in the mortality among the Hindus was the greatest, then came the Christians, and lastly the Mussulmans. The increase in the death-rate was 4·6, 3·1, and 1·8 per 1,000 respectively. From a comparison of the birth and the death-rates among the different castes it is seen that only the Christians gained 4·2 per 1,000 of their class; whereas the Hindus and the Mussulmans have lost 2·1 and 4·6 respectively.

No less than 5,860 children under one year of age died during the year, giving a death-rate of 583·6 per 1,000 of population against 540·7 in the preceding year. In 1888 the death-rate among infants in Calcutta was 413·9 per 1,000 of population and in Bombay it was 294·04. The mortality among infants has always been high in this

city, and Government is of opinion that the high death-rate is due to the insanitary condition prevailing in Madras. No doubt it is the opinion of statists, that the high infantile mortality is an invariable result of bad sanitation. But in this connexion it must be borne in mind that the year under review was an exceptional one owing to a severe epidemic of measles—which was peculiarly fatal to children, mostly ill-fed and ill-clothed and thus rendered peculiarly obnoxious to fatal results. From 10 to 15 years appears to be the healthiest age. In regard to the mortality under different ages of the sexes results similar to those experienced in the year preceding are also observed during the year under report.

Mortality according to sex.—Of the 17,086 deaths during the year, 8,464 were males and 8,622 females, and the proportion of male to female deaths was as 98·1 to 100.

The following statement will contrast the deaths from the prevalent diseases during the year with those in the preceding year :—

Years.	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Total.	Other Causes.	General Total.	Ratio per 1000.
1888 - - -	36	49	3,372	2,568	543	6,568	8,871	15,430	38·7
1889 - - -	45	1,204	4,154	2,993	182	8,578	8,578	17,086	42·8
Average of 10 previous years.	988·5	127·2	3,647·2	2,377·1	324·7	7,464·7	8,097·9	15,562·6	39·0

From the above it is seen that, except the mortality under cholera, and "other causes," the figures under the other heads during the year were greater than the corresponding figures of the year preceding.

Small-pox.

During the year there were 45 deaths from small-pox, against 36 of the previous year, and 988·5—the mean of the past decade. Of the 45 deaths, 14 occurred in the first quarter of the year, 22 in the second, 4 in the third, and the remaining five in the fourth quarter. In the last quarter of 1888 it was reported that eight deaths had occurred. The number of deaths increased therefore in the first quarter of the year under report, as also in the second quarter. In the third quarter there was a sudden fall with a slight increase during the last quarter. Of the 14 deaths during the first quarter, in nine cases the disease was imported from outside of the municipal limits and in the remaining cases it originated from spots were it had existed previously. In the majority of deaths during the second quarter the disease was alike imported, and during the third quarter it was traced to importation in every instance. During the last quarter all the deaths occurred among the fisherman caste of Cassemode Cuppum, first division, where the disease by that time had established itself, as being the spot where vaccination had till then to contend against unsuccessfully. It is to be noted that in every fatal case the victim, generally a baby of five or six months old, was unprotected, and this strengthens the fact that mortality under this head can be reduced to a minimum, if the people, without exception, could only by a full acceptance of Jenner's great discovery willingly apply it to their children at an early stage. There is yet another practise—it can with propriety be said even custom—amongst the Hindus, in which they are followed by their Mussulman brethren, of not resorting to remedial measures when their children are attacked with small-pox. Be their children at the point of death, no medicine will be administered to avert danger. This omission is so very common amongst them, that the unfortunate children, being left to themselves, often succumb to the disease. They are ready, however, to assign a traditional cause to justify their conduct; to wit—that the goddess Maury, by whose spell the disease breaks out, is believed to be greatly offended, if medicine be administered to them. It is curious to mark that the mortality from this cause was evenly distributed among different castes during the year; the death-rate being 0·1 per 1,000 under each class.

Measles.

No less than 1,204 deaths were returned under measles during the year, against 49 in the preceding year, and 127·2 the average of the previous ten years. The figure is the largest yet registered in any of the years. In the first quarter 337 deaths were reported, and in the second the mortality rose dreadfully to 629. In the succeeding

quarters there was a decided tendency to decrease. In the third 168 deaths were reported, and in the quarter following only 70 deaths were recorded. The virulent aspect, during the year under report, of this disease, which generally ran a mild course in the city, attracted the attention of the surgeon-general who issued instructions to the District Surgeons to inspect their districts, and to report on the prevalence of the disease. Surgeon-Major H. D. Cook, in charge of the first district, had to visit parcherries, hunting grounds, and other crowded parts of his range, and after a close and searching inquiry was of opinion that the disease prevailed more in filthy and crowded parts, and killed mostly children belonging to the poor, who were unable to protect them from exposure to chills by warm clothing.

The mortality under cholera during the year compared favourably with that of the preceding year, and the average of the past decade. There were 182 deaths from cholera, against 543 in the previous year, and against 324·7 the decennial average.

During the year there was the continuation of the cholera outbreak of August 1888, and a fresh outbreak in September 1889. In the first quarter of the year, 75 deaths were registered, against 159 deaths recorded in the last quarter of 1888. Of those, 31 occurred in January, 38 in February, and in March the mortality fell down to 6. The mortality was severe among the Mussulman class. In the second quarter there were 46 deaths—5 in April, 32 in May, and 9 in June. There was a sudden rise in May, the incidence of the disease being greatest in the 1st division. Of the 46 deaths, no less than 42 occurred among Hindus, and the Mussulmans enjoyed perfect immunity from the disease during the months of May and June. In the beginning of the third quarter, the number of deaths began to decrease. Only 4 deaths occurred in July, and another 4 in the succeeding month. It was only in the month following the fresh outbreak of cholera occurred. In September 39 deaths were recorded, against 4 in the preceding month. During the third quarter, in all 47 deaths were reported, of which 32 occurred in the 1st division and 6 in the 8th division.

There were distinct causes for the appearance of the disease in each of the two divisions. In regard to the 1st, a family from Nagore, where they had gone on a pilgrimage to the Mahomedan shrine, visited on their return the Mussulman hutting ground at Tondiarpett, inhabited by the fishermen class. Soon after their arrival one of their members was attacked and succumbed. The disease spread to the neighbouring huts. It then broke out in Cassi garden and Amaranthipuram Cuppam, also inhabited by the fishermen who are either Christians of the Catholic Church or Mussulmans, and before the month came to a close 51 persons were attacked, and in 28 cases it proved fatal. Great fears were entertained that the disease would spread to other divisions, but the prompt sanitary precautions taken arrested its further progress. All the infected huts were pulled down and burnt with the consent of the owners who received compensation. New streets were opened out to allow the conservancy cart to pass through freely. A special conservancy staff was provided to look after the sanitation of the infected locality, to promptly remove and burn all cholera discharges, soiled clothes, &c., to attend to the constant burning of sulphur and tar fumigation, and to prevent people from resorting to wells in and about the place for their water-supply. Well water-supply was completely shut out, and the supply of wholesome drinking water from the Red Hills was extended in the locality by constructing new fountains at convenient spots. This was not all; bonfires at different places about the infected locality were burnt, and the services of an hospital assistant were specially engaged for the occasion to treat the affected persons. The people who got frightened at the onset of the disease were constantly given advice and encouragement. In the beginning a good deal of opposition was shown by those stubborn fishermen to taking medicines from the hospital assistant, but subsequently they were convinced. Most of the fishermen being very poor, living upon their daily labour, often had no means to sustain their sick relations. They were obliged therefore to desert, and many actually left the patients to themselves; and in such instances the municipal special staff undertook their care and feeding and afforded them all possible reliefs. While every endeavour was being made to stamp out the disease in the 1st division, it appeared in the other flank of the city, namely the 8th division. Six people fell victims to the epidemic in a very short time. The appearance of the disease in this side was not due to any importation from the 1st division, but as was already observed it had a distinct cause. A few orphans belonging to the Roman Catholic Orphanage were taken by a priest in charge to the Little Mount at Saidapett, on a pleasure trip. They resorted for their water-supply to the river close by, in which the dhobies of Saidapett wash all sorts of soiled clothing. Some of the orphans had symptoms of cholera at the Little Mount

and were brought over to Notchecuppam (inhabited by the fishermen caste), adjoining St. Thomè. A cook who accompanied the orphans to the Little Mount was attacked and it soon spread to his family. Most of the members including the cook himself succumbed to the disease, which soon began to extend itself to the fishermen hamlets in the vicinity. Immediate steps were adopted to thoroughly clean and disinfect the places. All cases were promptly isolated and treated and all infected huts were burnt, with the result that the disease was successfully stamped out.

In the 4th quarter though 14 deaths were recorded, not a single death occurred in the 1st division, and in the 8th division only two were reported in October, and none in the succeeding months. Of the 14 deaths during the last quarter, seven occurred in the month of October, one in November, and the remaining six in December. The disease was confined during this quarter more to Christian than any other class. Having in view the fact that cholera attained formidable proportions in the month of September, it is gratifying to observe that the measures taken to arrest it were successful; for it is found that only 14 deaths were registered during the last quarter of the year, a season very favourable to the nurture and development of the disease.

The mortality among the castes from the disease has not been the same during the year. The Christians suffered the most, the Mussulmans came in for the next share, and lastly the Hindus. The rates of mortality among these classes, namely, the Christians, the Hindus, and the Mussulmans, were in the ratios of 0·8, 0·3, and 0·7 per 1,000 respectively. Out of 182 total deaths from cholera, the largest number, viz., 72, occurred in the 1st division, and the least, viz., 3, in the 6th—a division largely inhabited by Europeans.

During the year the mortality from fevers was something abnormal. The number of deaths from that cause amounted to 4,154 against 3,372 in the preceding year and 3647·2 the average of the decennium. The number reported during the year is greater than all the corresponding figures of the decennium, the death-rate being 10·4 per 1,000. The ratio of deaths from this cause in the preceding year had been 8·4 and the increase during the year under report was due to the prevalence of measles of a severe type in the city which swelled the statistics under fevers. Infants that were attacked with measles, through the carelessness of parents, were exposed to chills, with the result that fever set in and killed them. In this manner a major portion of the total deaths could be accounted for. Of the total deaths 1,944 were males and 2,210 were females.

The mortality from fevers increased much among the Hindus, and no year in the past decade recorded such high mortality (11·0 per 1,000). Among Christians 7·3 and Mussulmans 9·0 it was below that recorded in the year 1887, the remaining years returning lower death-rates.

Under the head bowel-complaints the mortality from dysentery and diarrhœa has been grouped together. The number of deaths from dysentery and diarrhœa was 1,945 and 1,048 respectively, making a total of 2,993 deaths from bowel-complaints during the year against 2,568 in the preceding year and 2,377·1, the average of the previous ten years. In the decennium the figures are all below those recorded in the year under report. The mortality compared unfavourably on account of the prevalence of measles which, as has already been pointed out, killed many an infant by its complications under dysentery and diarrhœa.

ABSTRACT OF REPORT OF THE BOMBAY MUNICIPALITY FOR 1889-90.

(*Mr. H. A. Acworth, Municipal Commissioner.*)

Public works.

Drainage.—The unsatisfactory condition of the pumping engines at the Love Grove Pumping Station, referred to in the last annual report, continued, and at last a complete break-down was threatened. The engines had to be taken down and put in proper working order. Auxiliary engines had to be procured. The cost of these arrangements was heavy; but the case was one of great urgency. The improved arrangements had a most marked effect in keeping down the depth of sewage. The sewers can now be flushed and cleansed with much less difficulty and much greater efficiency than formerly.

Serious complaints were frequently made regarding the alleged defective sewerage arrangements, and the general insanitary condition of the Marine Lines. Government appointed a committee to investigate and report, but, owing to the conflict of opinion on this, and on every sewerage and drainage question in Bombay, and to the urgency of drainage arrangements being provided for Colaba and the northern districts of the island, it was deemed to be essential that some eminent authority on sewerage should be consulted. Accordingly, with the approval of the standing committee, and under a general sanction from the Corporation, the Commissioner invited Mr. Baldwin Latham to Bombay. This gentleman, who is one of the first sanitary engineers in Europe, arrived in Bombay in January of this year, and at once began a most thorough and exhaustive inquiry. He has submitted a most valuable report, which however, was not printed and published until after the official year had closed.

Plans and estimates for the sewerage of Parel, Mazagon, Umerkhadi, and Colaba were prepared, but these works, though of great importance and urgency, cannot be undertaken until the preliminary question of an outfall is settled.

Waterworks.

Tansa.—Satisfactory progress has been made in several divisions of the Tansa work during the year. The out-turn of masonry work was 3,103,689 c. ft., nearly 50 per cent. in excess of the previous year. The excavation for the foundations was not completed at the close of the year; but it is believed that the most serious difficulties have been overcome.

At the commencement of the year, works to the value of Rs. 16,40,000 had been executed, and at the end of the year the value of work done was Rs. 32,60,000. The total length of tunnelling executed to the end of the year was 13,070 l. ft. The whole of the land for the lake, and the greater part of that for the duct, has been acquired.

The rainfall of the year at the dam site was 97·37 inches. The average of the previous four years was 103·33 inches.

There was no serious outbreak of cholera, but there was a good deal of malarious fever. The municipal staff, the contractor's staff, and the workpeople suffered a good deal from it. The influenza epidemic appeared on the works, and while it lasted very appreciably diminished the numbers of hands.

Vehar.—The rainfall for the year at Vehar was 85·24 inches, 4 per cent. above the average. The increase in quantity stored on the 31st October over that of the 31st May was 3,186 millions of gallons. This, however, was less by 470 millions than the quantity stored at the corresponding date of the previous year. The water-level on the 31st October 1889 was 1·75 feet lower than it was on the 31st October 1888. The gradual fall of the water-level of the Vehar Lake and a consideration of the serious consequences that might follow, led to the adoption of the Pawai scheme referred to in the introductory remarks, and fully explained in the report.

Pawai.—The works consist of two masonry dams, one across the Pawai nullah, and one across the Goper river, about one mile below the Vehar Lake. Arrangements are made to pump eight millions of gallons in the twenty-four hours through the Vehar mains. The works were well advanced at the close of the year.

Tulsi.—The rainfall at Tulsi for the year was 92·92 inches, being about the average quantity. The supply to the city was restricted to four-fifths of the usual supply from the close of the monsoon until the close of the official year. The catch water-channel on the western side of the lake was available in the rains of 1889. The completion of the concrete trench on each side of the waste weir has stopped the leakage through the wings.

Bhundarwada Reservoir.—Provision was made in the budget for the cost of works to reduce the leakage from the Bhundarwada Reservoir; but the works were not undertaken during the year.

Malabar Hill.—The work of improving the floor of the settling basin of the Malabar Hill Reservoir was commenced during the year, and a portion of the walls was protected by the injection of Portland cement under pressure. The result was satisfactory.

The total number of new water-connexions made during the year was 978. There were 178 disconnexions—net increase 800. The total number of connexions is now 16,898. The increase demand on account of these new connexions is about ¾ million gallons per day, or about 1,000 gallons for each connexion.

Dipping wells in the city are being gradually superseded by taps and fountains. Dials are being substituted for clocks and drums. It is anticipated that this change will secure economy without loss of efficiency. There were a few bursts in the mains, but no serious inconvenience was caused in the supply of water to the city.

Public health.

The Health Officer's report is for the calendar (not the official) year from 1st January to 31st December 1889. The report is a valuable one. The total number of deaths from all causes during the year is 23,378, being 957 in excess of the previous year; the death rate was 25·16 per 1,000. The increased mortality is due to a continual flow of indigent and vagrant persons into the city from surrounding districts and distant provinces. The mortality amongst persons born in Bombay was 26 less than in 1888, and amongst persons not born in Bombay, 983 in excess of that year.

In attacks of cholera also a large proportion is amongst strangers. Of 603 persons attacked with cholera during the year, 509 were strangers, of whom 223 were under six months in Bombay and 152 under three months. These strangers, who are mostly of the labouring classes, include vagrants, lepers, diseased and sickly persons, who, from depraved habits, exposure and privation, readily succumb to any disease with which they may be attacked. It may perhaps hereafter be found necessary to guard the approaches to the city, so that persons found to be suffering from a dangerous or infectious disease, or leprosy, may be intercepted and taken to a dhurmsalla, or to a leper asylum for treatment or disposal. Sickly vagrants and lepers would then probably find Bombay less attractive than it is now.

The Health Officer draws attention to the fact that the use of well-water is becoming more common of late, owing, he thinks, to increase of population and the comparatively diminished sufficiency of the Vehar and Tulsi water-supply. He also shows how this bears on the question of mortality from cholera. Attacks of cholera are more fatal amongst the well-water drinkers than amongst the users of Vehar and Tulsi waters.

The number of deaths from small-pox was 304, being 178 less than 1888. There were no deaths from small-pox in any part of Colaba, or in the southern division of the Fort, or in Sewree section.

The deaths from fever were 7,266, being 624 more than in 1888; the mortality was greatest in the first five months of the year. The highest mortality was in Parel, Sewree, Mahaluksmi, Byculla, and Kamatipura.

There were 608 deaths from measles, being 417 more than in 1888. The greatest mortality was in March, April, and May.

The number of births (exclusive of still-born) were 15,493 or 1,267 less than in 1888. The number of deaths (23,378) are out of proportion to the number of births, showing that the arrangements made for the registration of births are still defective.

The following table shows the number of persons vaccinated compared with the two preceding years, the number of persons under one year primarily vaccinated and the number of persons re-vaccinated :—

Year.	No. of Persons primarily Vaccinated.	Primarily vaccinated under one Year.		Re-vaccinated.
		No. of Persons.	Successful Vaccination.	
1887 - - -	17,063	13,866	16,571	833
1888 - - -	18,144	14,815	16,875	3,499
1889 - - -	20,337	15,355	18,841	4,498

The Health Officer invites attention to the fact of houses being re-built on their old foundations without sufficient space being left around them for lighting and ventilation; some rooms of the houses not being open to the external air. The sanitary defects of the old buildings being reproduced in the new ones.

The Health Officer draws attention to the serious nuisance from the reservoir on the Flats. It is described as being, at certain seasons of the year, a pond of sewage nearly as foul as the sewage of the open main drain, and smelling most offensively. The smell has been perceived at times as far off as the Fort; nothing but the completion of the sewerage and drainage of the city can altogether cure this.

The Health Officer is of opinion that the nuisances so common on the public streets will not be prevented until the chief officers or the standing committee of the municipality have power to punish offenders by inflicting small fines. I am afraid the suggestion is an impracticable one.

The enormous quantities of garbage, filth, and night-soil removed from the city are noticeable. 4,011 men and women, 704 scavengering and drain carts, and 155 night-soil and cesspool carts are employed daily in collecting and removing filth; carts making from two to five trips a day. 304,662 tons of garbage, &c., collected in the year, as against 300,249 in 1888, 128,986 tons of night-soil (353 tons a day) as against 127,287 in 1888.

The Health Officer renews his appeal for the speedy adoption of some system of drainage for the outlying districts. New towns are springing up; houses being built in every direction; no drainage provided; houses standing in pools of foul sewage.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF BOMBAY FOR 1889.

(Dr. T. S. Wier.)

The abnormal conditions indicated by scanty rainfall, have been accompanied by an increase of mortality chiefly during the first five months of the year. On examining the mortality according to place of birth, it will be observed that the increase of mortality has been amongst strangers. The total mortality is 957 more than in 1888. But this increase has only been among strangers, whereas the mortality amongst persons born in Bombay is 26 less than in 1888. This is indicative of the changes taking place in the population of this city:—

	1888.	1889.
Born in Bombay - - -	11,154	11,128
Strangers - - -	11,063	12,071

This is very interesting, as indicating the influence of abnormal seasons on the mortality of the city, and shows what I have often pointed out before, how the health of the city is influenced by conditions around and without the city.

The immigration of destitute from Kathiawar and Guzerat, which had commenced in October 1888, ceased before the rains of 1889. It was difficult, as I have before described, to control the immigrants, and it was even more difficult to remove the immigrants from the city. The Health Department put up temporary sheds near the Byculla tank and station and fed a number of the destitute. From Byculla they were removed further off to hospital sheds at Arthur Road, and here they were cared for by the relief committee. On the 12th November 1888, the standing committee recommended the Corporation to sanction a grant of Rs. 2,500 for a relief camp. The number of destitute and vagrants in the city—in the streets—caused obstructions. They lived and slept were they pleased on the streets—on the footpaths. One footpath they took up a position on, was nearly opposite the Fort Police Court. Some 800 were sent back to their homes. But a large number refused to leave the city.

The immigrants were causing so much nuisance and persecuting people who would not give them alms, that 600 were forcibly removed to hospital sheds at Byculla. Then arrangements were made to send them away by sea, but they refused to go by sea, and would only go by land. They did not wish to leave this city, and many of them could not do work which they were not accustomed to. They said work in Bombay was too hard, and they could not do it, and it was not work which they could do.

With the immigration of destitute and vagrants, there has also been an increase in the number of lepers. The increase in the number of lepers is very serious. In 1881 at the time of the last census, 430 lepers were enumerated. There are now more than twice that number, probably more than 1,000. In every portion of the city, lepers may be seen, and it is not improbable that there may now be more than 1,000 lepers in the city. Lepers wander through the city, associate with people who are not lepers, live where they please, even live in rooms with other people who are not lepers. Lepers sell in the streets and in shops. Near the Pydhoni Police Office a leper may be seen with ulcerated feet and fingers selling jewellery. There are lepers propagating leprosy. I will give one instance: one evening, while inspecting a bakery, I found a leper inside the bakery leaning with ulcerated fingers on the table where the bread was lying. I believe this leper was living in this bakery. I have seen so many instances in which the evidence of communicability seemed clear, that I have no doubt that leprosy can be communicated. I will give two instances:—

A.—in whose family leprosy was not hereditary, was in the habit of purchasing vegetables from a leper. He did so out of compassion for the leper, although warned of the danger. He thought there was no danger as leprosy was not hereditary in his

family, and he continued to purchase vegetables from the leper. He went on doing so for some five years, when he commenced to suffer from leprosy, and died of the disease. His wife afterwards suffered from leprosy, and one of his children.

B,—who came from outside of India, married a woman suffering from leprosy. He knew that she was suffering from leprosy, and as none of his relatives had suffered from leprosy, he thought there was no danger. His wife became worse after marriage and in some three years he became affected with leprosy, and now after five years he is seriously ill, and a child born to them seems also to be suffering from leprosy.

I have no doubt as to the necessity of removing lepers from the city and segregating them. It is useless to attempt to deal with lepers after the procedure in the Municipal Act for offences against the public health. Under the Municipal Act, lepers cannot pratically be interfered with. Lepers, however poor and however distressed, will not willingly leave the city. They would rather lie down and die in the streets of starvation, or commit suicide, than go to an hospital and lose their freedom. I doubt very much whether leprosy is a dangerous disease, as meant in (*A A*) section 3 of the Municipal Act.

However, in exercise of the power conferred by section 12 of Act VI. of 1867, the Governor in Council has notified that "Black Leprosy" is an infectious disease dangerous to life.

A good instance of what can be done by common sense sanitation, occurred in 1881 in a village of Matoonga which was afflicted with guinea-worm. I found 89 people in a village of 297 suffering from guinea-worm. Pipe water was supplied to the people, and guinea-worm has disappeared since. This I bring forward as an instance of what can be done by common sense. I believe if practical sense was equally used in the case of leprosy, the effect would be equally good.

During the monsoon there was a serious nuisance from the reservoir on the Flats; so serious a nuisance has not been known for many years. It was perceived as far off as the Fort. After the discharge of sewage into the reservoir, the smell was dreadful. The lake was a pond of sewage. The water of the lake was nearly as foul as the sewage of the open main drain. The results of my examination were:—

	Free Ammonia Pts. per million.
Open main drain sewage	20
Water of the lake near the inlet	14
Water of the lake near the outlet	17

The cause of the nuisance was a deposit of sludge, and the cause of the nuisance being greater than in any former year. The deposit—

A. Obstructs the circulation of the water.
B. Retards the diffusion of the sewage.
C. Causes a current of sewage to the Vellard.
D. Exposes a greater surface of sewage to the atmosphere.
E. Spreads the sewage out across the reservoir—the distance between the east and the west, or say about 800 yards.

On one occasion early in the morning I followed the sewage from the sluice gates to the Vellard, Mahaluxmi; the stream of sewage on entering the reservoir set towards the Vellard, and was preceded by a wave or border of charcoal and sewage matters some two feet broad. The rate of motion, as I timed it, was on an average 45 feet in one minute and twenty seconds. I followed the sewage till the current arrived at the Vellard. It now extended in an irregular line from the Vellard east, across the reservoir, having the greatest surface as follows, the apex being towards the Vellard. In about two hours the surface of the water of the reservoir, as far as I could see, was covered with sewage, *i.e.*, in a few words, the reservoir was more or less converted into a sewage pond.

I forwarded to the Standing Committee a sample of the odours from the reservoir in a bottle of water from the reservoir.

Each year there is a discussion in regard to reducing expenditure in the Health Department. There is no difficulty about reducing expenditure in the Health Department, but expenditure can only be reduced by reducing work. I will afterwards show how expenditure can be reduced, if the only object is the reduction of expenditure.

There is, I am afraid, much misunderstanding in regard to the duties performed by the Health Department, and also in regard to the responsibility of the Health Department. The duties which the Health Department perform may be divided into :

A. Those which the Health Department perform for the public.
B. Those which the Health Department compel the public to perform for themselves.

The conservancy duties, which the Health Department perform, are the cleansing of privies—public and private—urinals, gullies—private and public—dust-bins—public and private—public streets, private streets, private lanes, and private wadies. It is necessary to understand the duties performed by the Health Department to comprehend what the Health Department are doing at the public expense and for private persons, duties which should be done at the expense of landlords and by landlords themselves. If the only object is the reduction of expenditure, my proposal is to cease cleaning private streets, private lanes, private wadies. The conservancy of private lanes and private premises will then depend on the punishments inflicted by magistrates, and the public will look to the magistrates. There will no doubt be serious nuisances, but, on the other hand, the public will be educated in practical sanitation and trained to protect themselves, for they will have to attend the police courts and give evidence, which very few people can now be induced to give. I am making this recommendation merely in reply to the proposals which are made from time to time for the reduction of expenditure. There is a way, and I believe it is the only way to reduce expenditure, and that way I have shown. I do not say it will be in the interests of public health, far from it. The cleaning of private streets, lanes and wadies, through which there are thoroughfares and which are so far as use public, came naturally to be done by the Health Department, because of—

A. The difficulty and delay in prosecuting the owners of private lanes, and the number of different owners.
B. The nuisance and injury to health of persons living in private lanes, while such prosecution was being conducted.

When I first joined the municipality in 1873, some public streets were not cleaned every day, and some were only cleaned once a day, and private lanes were cleaned once a week or so. Now, all public streets are cleaned more than once a day, and many private lanes twice a day. The number of private lanes being cleaned by the Health Department has increased enormously during the last five years. Groups of new houses in every wadi form private lanes, and these lanes are being cleaned by the Health Department. In Girgaum, Byculla, and Parel, where there were no houses before, there are now a large number of private streets to be cleaned by the Health Department. In some portions of the city, the sweeping work of the Department has enormously increased. The Health Department are doing for owners of property, in order to protect the health of their tenants, what the owners of property themselves should do.

I have in previous reports referred to nuisances on public streets. I am afraid that until the Municipal Commissioner or the Chief Officers, or the Members of the Standing Committee have power to deal with small offences against public health, there will be no improvement in the sanitation of streets, and no practical prevention of nuisances. It cannot be too widely known that persons committing nuisances can only be punished by magistrates, and that persons allowing nuisances on private property can only be punished through magistrates.

Considering the number of gullies, paved and used as sewage channels, there is little excuse for people using the public thoroughfares. I recommended that the mouths of gullies be paved and constructed in the form of oval-shaped open drain to be used as urinals. This is a very useful form of urinal. People do not much use the urinals that have been put up. They like to use the ground outside the urinals. A movable urinal that I suggested has been sanctioned.

In conclusion I would state that during the recent strike, the nuisance caused by the cessation of work for even one day has demonstrated to the public what an interruption in the work of the Health Department means. The failure to clean a dust-bin for one day has results which few people realised till the strike occurred.

My criticisms in a former report on mills have not been, in some cases, understood as I intended. I think the sanitary condition of the mills, generally, is good. There is open space around the mills, and the rooms are of fair height, and the latrines are

well placed. In Bombay, factories have more open space around and more room ventilation than factories in England. The operatives have an equable, although a hot, climate to live in. Such are the conditions favourable, but there are conditions unfavourable; of these, I consider the most depressing, the long hours of work and short hours for sleep; more than one short interval of rest in the middle of the day is needed.

The conditions around the Flats have changed so much that I do not think the deposit of the refuse on the Flats can much longer be safely continued. The difficulties surrounding the settlement of this question have changed very little since my report of 1884. It is now a most urgent question.

I forwarded you a report from Inspector, B. Ward, Mr. Glover, on houses being built or rebuilt without sufficient open space around them for wholesome ventilation and lighting. I inspected the houses, and some of them were of the worst type of building, without open space on either side, and therefore with room space which could not have direct light from without, and could not be wholesomely ventilated. This is the type of building which had to be permitted under the old law, and which cannot be prevented in the case of houses built on old foundations as in the cases under the new law. I wrote: "If under the present law, buildings such as are shown in this state-" ment can be erected, then with the new law, sanitary building will be as impossible " as with the old law, and the condition of new buildings will be no better than the " condition of old buildings." The houses were built on old foundations and therefore the stringent prosecution I urged could not be conducted.

Return showing the Number of Deaths from Different Causes in 1889.

Causes of Deaths.	Number of Deaths.	Rate per 1,000 of Population.	Remarks.
Small-pox	304	·33	Annual increment of population calculated.
Measles	638	·70	
Fever	7,266	7·99	
Cholera	462	·51	
Phthisis	2,805	3·09	
Diseases of the Nervous System	2,122	2·33	
„ Respiratory System	3,942	4·34	
Diarrhœa	1,099	1·21	
Dysentery	625	·68	
Accidents	379	·42	
All other causes except Still-born	3,736	4·11	
Total	23,378	25·71	

As in the previous year, the mortality of male children is higher than of females under one year of age, while from one to five years the incidence of the female mortality is a little higher. From 6 to 45 years the female death-rate is higher than the male. Taking the nubile period, between 12 and 40 years, the female mortality is 6·07 per 1,000 higher than the male death-rate. From 40 to 60 years the incidence of the male mortality is higher than female. The total female mortality is 8·8 higher than the male. The excess of female mortality is 1·8 more than in 1888.

The mortality of children under one year of age (291·2) is 2·8 less than in the last year, but over one and up to five years, the mortality is 33·85 more than in the last year. Of the deaths under one year of age, 3,467 were males and 3,124 females, the male death-rate being 311·4 and the female 271·5. 236 children under one year of age died from measles. The fatality from small-pox amongst children at the same age is 116, or 69 less than in the last year. The proportion of deaths under one year of age to births is 42·54, or 2·83 more than in the last year. The percentage of deaths under one year of age to births is therefore little higher than in the past year.

The mortality amongst the mass of the Hindu population is (not calculating the annual increment of population) a little higher than in the previous year. It is equal to 28·78. The death-rate amongst Jains is lower, but this small class is liable to great fluctuation. The mortality of Hindu low or out-caste has increased. The out-caste population is increasing rapidly, and it is a population living under unfavourable

conditions—crowded into the most crowded chawls, more than one family in one room. There is no condition of life so depressing as the life of the Hindu out-caste. It is difficult to improve their condition. If they go into good houses or large rooms, they divide them, place partitions, and make them unwholesome; their poverty and absence of caste-training make them helpless.

There is an increase of mortality in the four great classes of the population, but the increase is less than shown, for the calculations are made on the population of 1881, and the natural increase of the population in each class has not been calculated. The expansion of population from immigration cannot be estimated. There is a slight increase of mortality amongst Europeans from 19·04 in 1888 to 20·66; amongst Parsees the increase is scarcely appreciable (22·88 against 22·67 in 1888), and if the natural increase of population was estimated, the mortality would probably be less than in the year before. The general health of the Parsee population may be considered to have been favourable. The European mortality is less than in the five years preceding 1882. The mortality amongst Mussulmans (35·20) is high, although not so high as shown, as there has been an increase from immigration in the Mussulman population. The overcrowding and house pressure in localities in which Mussulmans live influence the mortality. Although the Mussulman mortality is less than indicated, yet it is high—higher than it would be with better street and house ventilation.

The section of highest mortality is Parel (55·76). In the last year the highest mortality also occurred in Parel. The district on the south of Parel, Byculla (47·57), has the second highest mortality. The population of both districts has greatly expanded. A portion of Byculla has a system of drainage but Parel has not. There are in both sections serious nuisances from houses without drainage, and where there is no drainage and around houses which have not been connected with drains, sewage pollutions amidst dwellings and around dwellings and around the district, sewage in pools, where there are dwellings, soaking into the ground, polluting ground and buildings and oozing from increasing fouiness to the ditches by the railway lines. Examining the mortality in Parel and Byculla, we observe that the increase of mortality in Parel is chiefly due to fevers and measles, and in Byculla to fevers, measles, diseases of the respiratory system, diarrhœa, cholera, and diseases of the nervous system. In a small district—Mahalakshmi—there has been a great increase of population, and the population is fluctuating. In Agripada, where a new city has arisen, the sewage from the buildings runs on to the lanes and from the lanes into the ditches. In every portion of the island, where is no drainage, and where there is more population than there should be where there are no drains, there are surface collections of sewage. Near the Chinchpoogly station, there has been a serious nuisance from a ditch of sewage; but there are other causes of high mortality in Parel and Byculla. The water-supply has not been as plentiful as the people require, and the result has been, especially in Parel, that the people have had to use well waters. In the three districts of the extreme north, the mortality is less than in 1888, Sion, Mahim, and Worli.

	1888.	1889.
	Per 1,000 of Population.	Per 1,000 of Population.
Sion	20·65	18·79
Mahim	29·10	25·47
Worli	39·53	24·04

The mortality in 2nd Nagpada (45·34) is 2·39 higher than in the last year; this section is in a very insanitary condition. The mortality for some years has been very high in this section, and I ascribe it to the intense house-crowding, imperfect house-ventilation and imperfect drainage. Within the buildings, the air is impure from imperfect ventilation, and outside the buildings the atmosphere is polluted from imperfect drainage. The drains are tracts under the ground and they have to be opened frequently. There is one sweeper's gully, which is constantly becoming obstructed, and which flows under a large number of houses. The drainage of this district is most urgent, and I have only one opinion to give on its sanitary condition—bad.

The infant mortality in these districts indicates that the chances of life are weak.

Measles.

The mortality from measles is more than in the previous year. 638 deaths were registered, being 417 more than in the last year and 194 more than the average. As in preceding years, the highest mortality has fallen on females. The female death-rate is 1·00 and the male ·70. In the previous year the male death-rate was ·23 and the female ·35. The incidence of measles follows the seasonal course observed in the appearance of small-pox. The greatest number of deaths was registered in the months of March, April, and May.

The highest mortality occurred within the first two years of life. The mortality of males at this period of life is higher than of females. Under one year of age, the mortality amongst male children was 11·13 and amongst females 9·73, and from one to five years of age the male death-rate was 5·99 and the female 5·67; from 6 to 12 years of age the female mortality is higher than the male, the male mortality being ·36 and the female ·45.

Notwithstanding the prevalence of measles, only one death occurred amongst Europeans.

Small-pox.

The mortality from small-pox, 304 or 0·33 per 1,000, is 178 less than in the last year, although 149 more than the average. The highest mortality in any large class occurred amongst native Christians, Brahmins, Hindu low-castes, and the mass of the Hindu population. I ascribe the high mortality amongst Native Christians to the immigration of unvaccinated Christians from Goa. The fatality amongst Hindu low-castes and Hindus of other castes is less this year by ·57 and ·37 in each class. As in the previous year the mortality of Mussulmans is relatively low, being ·23 against ·34 in the year before. The mortality amongst Europeans and Parsees is to all other classes amongst whom deaths occurred relatively low. Both in this year and in the previous year the mortality from small-pox amongst Parsees was low. In the previous year it was ·10 and this year it is ·18.

Cholera.

Of cholera 603 cases came to my notice, and 462 ended fatally. The greatest number of deaths occurred in January, July, and August; of the 603 cases, 426 were males and 177 females, the proportion of deaths to attacks amongst males being 77·2 and females 75·1. The percentage of deaths to attacks is higher than in the previous year, being 76·6 against 70·4.

The influence of the immigrant population on the incidence of cholera is more strongly indicated this year than in the last year, although there was a great importation of cases of cholera in 1888. In 1889, although the total deaths from cholera are 83 more, the deaths amongst the population born in Bombay are only four more, whereas the deaths, amongst the population not Bombay-born, are 57 more, and the mortality amongst the Bombay-born is 13 per cent. less than amongst the strangers. The industrial prosperity of the city is drawing an enormous number of the poor and the indigent to the city. We have not only the labourers but the poor with us. The following table will be of much interest:—

For 1889.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Bombay - - -	77	50	64·9
Elsewhere - -	509	397	77·9
Unknown - - -	17	15	88·2

If the length of residence is grouped into two periods, under three months' and under six months' residence in this city, the following are the results, and significant these results are. 223 cases out of 603 occurred amongst persons who had been under six months in this city:—

Duration of Residence in Bombay.	Attacks.	Deaths.
Under 3 months - - -	152	117
Under 6 months - - -	71	53

A considerable number of cases, 40 in all, occurred amongst well-water drinkers, and the mortality amongst these well-water drinkers was higher, being 80 per cent., than amongst those who drank Vehar or Tulsi water. I can only write, as I did in the past year, that the use of well-water is becoming more common, owing to increase of population and less Vehar and Tulsi water relatively to the population. A classification of cases of cholera according to water-supply gives the following results:—

For 1889.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Vehar and Tulsi water consumers -	553	423	76·4
Well-water drinkers - - -	40	32	80·0
Unknown - - - -	10	7	70·0

In previous reports I pointed out the relation between residence and material conditions and the incidence of cholera, and that persons living on ground-floors, and who are poor, are the most susceptible to cholera; generally the persons living on ground-floors are of the poorer classes. The conditions generally surrounding cases of cholera arise from imperfect ventilation and imperfect drainage. The house-crowding in the city is very great, and the contamination from it terrible. Practically, all that can be done is to lessen the effects of overcrowding by ventilation.

There were 462 deaths registered from cholera, being 83 more than in the previous year and 94 more than the average. Of the large classes of population, the highest fatality occurred amongst Native Christians (1·27) and amongst the mass of the Hindu population. The Native Christians, who live in Coors, live under very unfavourable conditions, and when cholera is prevalent, cases occur in the lodging-houses where Christians are crowded. I ascribe the pre-disposition of Native Christians to cholera to the crowding and the conditions under which they live in lodging-houses. Although the total mortality from cholera throughout the city is more than in the previous year, the mortality in one large class—Mussulman—is lower.

The highest mortality occurred in Girgaum (2·72) Mahalakshmi being second, and Byculla third in fatality. In two sections, the Fort North and Mahim, the death-rate is equal, being 1·09.

Fevers.

In the report of the last year I pointed out the influence of abnormal atmospheric conditions on the public health. These influences have been perceptible this year with a scanty rainfall. The mortality from fever is 7·99 against 7·45 in the preceding year. 7,266 deaths were registered, being 624 more than in the preceding year and 956 above the average, although it must be remembered that the average includes a period of two years, in which there was a remarkable reduction in the mortality from fevers. The increased mortality this year occurred chiefly during the first five months of the year; during the last three months the mortality was lower than in the preceding year.

Of the total deaths from fevers, 5,577 were referred to remittent fever, being 576 more than in the last year and 747 more than the mean of the last five years; 405 were ascribed to ague, being 155 more than in the last year and 176 more than the average; 1,259 were due to simple continued fever, being 122 less than in the last year, but 23 more than the average, and 25 were referred to enteric fever, being 15 more than in the last year and 10 more than the average. The highest mortality has been registered in Parel, Sewri, Mahalakshmi, Byculla, and Kamathipura. The four districts in which the greatest excess of deaths from fevers, as compared with the preceding year, are Parel, Mahalakshmi, Byculla, and Upper Colaba, and the five districts in which there is the greatest excess, as compared with the average, are Parel, Byculla, Mahalakshmi, Sewri, and Upper Colaba. In eight districts the mortality is less than in 1888. They are Worli, Mazagon, Tardeo, 2nd Nagpada, Mahim, Tarwidi, Kamathipura, and Fanaswadi. In 22 sections the mortality is above the total average for the city, and in 10 sections it is below. The sections having a mortality below the average are Upper Colaba, Fort South, Fort North, Esplanade Market, Fanaswadi, Chowpati, Walkeshwar, Tarwadi, and Sion.

The incidence of fever mortality by race is nearly the same as in the previous year; amongst the small community of Negro-Africans the highest has occurred, then Jains,

and following Jains, Hindu low-castes. The mortality amongst Hindu low-castes is very little more, and probably would not be more than in the previous year, if the increase of population was known.

s. The mortality from phthisis is 78 more than in the last year and 14 less than the average of the previous five years. Last year 2nd Nagpada was the section in which the highest mortality from phthisis was registered, and in this year also 2nd Nagpada has the highest mortality, although the death-rate is less than in the last year. In Chuckla and Girgaum also the death-rate from phthisis is a little less than in the last year. Kamathipura, which had ascended from the 8th to the 7th place last year, has ascended this year to the 2nd place on the phthisis mortality list.

During the year 15,493 living and 1,224 still-born births were registered. Of the living births, 8,064 were males and 7,429 females. The proportion of male to female births is 108 to 100. The birth-rate is equal to 20·03 per 1,000. A higher birth-rate has been registered amongst Eurasians, 71 per 1,000, Jews 40, Jains 31, Hindus low-castes 27, and Parsees 26.

APPENDIX.

No. 1.

MEMORANDUM of the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER with the GOVERNMENT OF INDIA for 1889.

The last of these Reports which we reviewed was for 1885, and we have now before us the Report for 1889. The statistics of 1885 had shown a considerable falling off in the health of the troops. The amount of sickness among the European troops had increased, so had the death-rate among both European and Native troops, and the general conclusion at which we arrived after a consideration of the sanitary history of that year was expressed in the following words:—"We have "shown that, notwithstanding the greatly improved health under effective sanitary work of European "troops, the reduction in the death-rates has not continued but has shown rather a tendency to increase, "indicating the need of pressing forwards the sanitary works we have advised, not only to continue "the improvements, but to hold the ground already gained, which the statistics show is in danger of "being lost. A similar remark applies to Native stations and to jails."

2. *European Troops. Army of India.*—So far as European troops are concerned, although there has been no increase in the admission rate, the daily sick-rate, the death-rate, and the invaliding rate have all considerably increased since 1885. In the European Army of India as a whole the rates of 1885 were 1,533, 71, 14·55, and 37 per 1,000 for the admission, daily sick, death, and invaliding ratios respectively. In 1889 they stand thus:—1,498, 86, 16·60, and 43. They are much more unfavourable than the unfavourable results of 1885, more especially the daily sick-rate, which had risen 15 per 1,000, and the death-rate which had risen more than 2 per 1,000. The increase in the daily sick-rate is no doubt attributable in the main to the enormous increase in venereal disease to which more particular reference will be made hereafter. The increase in the death-rate is not to be accounted for by prevalence of cholera, for this disease caused fewer deaths than usual; but enteric fever contributed no less than 423 fatal cases, a higher proportion than has ever been recorded before. The loss by invaliding was greater than it had been since 1884. We shall not reproduce the figures for a series of years, because they are already succinctly tabulated in the Report, in which the Sanitary Commissioner has stated the statistical facts very clearly, both as respects 1889 and the previous years with which comparison is made.

3. *Army of Bengal.*—The unsatisfactory results of 1889 in the European Army of India as a whole we regret to see arise from a general deterioration in all the three presidencies. In Bengal the admissions into hospital, which in 1885 equalled 1,661 per 1,000, had it is true declined to 1,517, but the daily sick-rate, which is a much more sure test of the amount of inefficiency, had risen from 73 to 87, and the death-rate, which had been 13·16 in 1885, rose to 16·07 in 1889. As in the Army of India as a whole so in Bengal, the increased sickness was chiefly due to venereal diseases, and the increased death-rate to enteric fever. More than 21,000 cases of venereal disease in its different forms were admitted into hospital from among the European soldiers of Bengal. Out of every 100 admissions into hospital from all causes, 32·38, or very nearly one in every three, were due to venereal diseases. Of 1,103 cases of enteric fever 286 died.

4. *Army of Madras.*—In the Madras Presidency matters were even worse, not only in themselves, but in the marked contrast they present to the experience of former years. From 1880 to 1885, inclusive, the annual mortality had always been under 11 per 1,000. In 1884 it was only 8·53, but in 1889 it reached 20·05, or about double the figure it had stood at for six continuous years. In the same way the daily sick-rate was no less than 90 in 1889, whereas for years it varied between 60 and 66. Since 1886 it has been high, ranging from 77 to a maximum of 90 in 1889, as already mentioned. Here we have the same general facts as have been already noted in Bengal. Venereal diseases represent about one third of the whole admissions of the year, 6,150 out of a total of 20,529; and although enteric fever did not add so largely to the mortality as it did in Bengal, it contributed very materially to the unfavourable ratio of the year.

5. *Army of Bombay.*—In Bombay the results were less unfavourable than in either Bengal or Madras. The admission, daily sick, and death rates were all lower, but the figures are unsatisfactory, especially when compared with former years. The admissions showed no very marked increase, but the daily sick rate (78) was higher than it had been for eight years, and the mortality (14·74) greater than in any year since 1885, when it attained the high ratio of 23·82, a result due in considerable

measure to cholera, whereas in 1889 the proportion contributed by cholera was small. The experience of Bengal and Madras is repeated in respect of the great and much increased prevalence of venereal diseases and the heavy mortality from enteric fever.

6. *Troops in Quetta and Burma.*—Although the troops in the Quetta district are included in the Bengal statistics, and the troops in Burma included in Madras, separate statements have been prepared to show the results in these two important commands. In the one these results are satisfactory, in the other they are unsatisfactory. In the Quetta command the admission-rate (1,152) is considerably below that of the Army generally, the daily sick-rate (58) is very much below it, and so is the mortality (9·95), in spite of the presence of cholera. Venereal disease was but little prevalent, 202 cases per 1,000 compared with 491 in Bengal. The mortality from enteric fever (4·52) although high, was much under the rate for Bengal (6·68). The Burma statistics are not nearly so good. The admission-rate equalled 1,903, the daily sick-rate 92, and the death-rate 29·22. Venereal diseases were prevalent in Burma, but cases of enteric fever were few, and the mortality from this disease small (2·28). In paragraph seven of the Report a comparison is made between the health of the troops in Upper and Lower Burma, and the contrast in favour of Lower Burma is very marked. In Upper Burma, which has been occupied only recently, the men were doubtless much more exposed.

7. *Detailed Comparison of the Three Presidencies and of Different Groups.*—In the Statistical Officer's Table V., which is one of the tables appended to the Report, full details are given of the extent of sickness and mortality in each Presidency. It may there be seen how the sick-rate varied every month of the year, how the different diseases contributed to the admission-rate, and in what proportion they made up the death-rate. It also shows how many cases of the principal diseases proved fatal out of every 100 cases treated. In Tables VI. to XVIII. the Armies of the three Presidencies are again subdivided into a number of geographical groups of stations, and the same particulars are given for each of these as have been already given for each of the Presidential Armies as a whole. In Table XIX. these particulars are again placed side by side for easy comparison, just as the details for the Presidencies are compared in Table V. under the various heads already noted. There are many points of much interest in this table; the fluctuations in the monthly sick-rate, from a maximum of 121 in Bengal Proper in January, and the same figure for Agra and Central India in September to a minimum of 43 in the Quetta District for February; the great variations in the admission-rates, from 1,151 in Quetta to 1,903 in Burma, and all the gradations of mortality between 9·95 in the Quetta command and 29·22 in Burma.

8. *Hill Stations.*—In these remarks the hill stations are not included. These form a special group by themselves, because the removal of troops and their families to the higher elevations is a sanitary measure which has been much insisted on, and to which great importance is very properly attached. Of the men in Bengal, 14,297, or 32 per cent., were in the hills principally during the hot months, besides 609 women and 1,307 children, the percentage of total strength being in the last two 40 and 44. It is satisfactory to find that the health of these troops was much better than it was in the Army generally, as indicated by 1,171 admissions into hospital, 68 sick daily, and 9·76 deaths per 1,000 of strength. Table XII., which relates to the hill stations of Bengal, shows an average strength of only 6,453, and the highest monthly average was 11,431. The number given in the statement contained in paragraph 13 of the Report would appear to be the number in the hills on a given date, and to include parties not entered in Table XII. Table XIII. includes the Hill Convalescent Depôts, which are filled with sick or weakly men, and so no fair comparison can be drawn between this and the other groups. Both admission-rate (1,600) and the sick-rate (99) are very high. In Madras and Bombay the hill stations and Hill Convalescent Depôts are joined in one table, No. XVIII., so that here also no fair comparison can be made, but, in spite of the addition of a certain number of sick and weakly men, the general results are very favourable as regards mortality, which equalled only 5·83, but unfavourable as regards sickness, which is represented by 1,303 admissions, and a daily sick-rate of 84 per 1,000, due in a large measure to venereal disease.

9. *History of the Chief Diseases. Cholera.*—We turn now from these general statistics of the three armies and their component groups to consider the history of a few of the chief diseases. To what extent did they prevail? How does this prevalence compare with the experience of former years? In what parts of the country was it most marked, and under what special local or other circumstances, so far as information on this most important point has been afforded? Table XXII. is devoted to illustrate the incidence of cholera during the year, the number of cases at each station of the European Army in the three presidencies, the months in which they occurred, and the number that proved fatal. As a whole, there was a great diminution of the disease from the previous year; both attacks and deaths fell to about one half. In Bengal particularly the proportion of cases, and of deaths was small, and compares favourably with the past, and, although the history of the troops in Madras and Bombay is not quite so satisfactory in this respect, still the disease was far from being prevalent in either. There are two points in this table which deserve notice, though they are by no means novel, and are indeed but a repetition of what is so frequently observed in the history of cholera. First of all we find that, although there was but little epidemic severity, the stations which furnished cases represent a very large area. This is most strikingly seen in the Bengal Presidency, where we have the disease at different points, from Fort William in the south-east to the Mean Meer in the north-west, and from Quetta in the west to Ranekhet in the east. The cause therefore, whatever it is, was very widely spread. But we note further that, although widely spread, it was nowhere manifested in any great intensity. In most of the cantonments the number of Europeans attacked was only one or two. The three exceptions

were Mean Meer, Neemuch, and Secunderabad, the maximum number (16) occurring in this last place, where the European garrison is large. It is satisfactory to find that movement into camp on the occurrence of cholera cases had been as usual attended with excellent results. In paragraph 152 we are told that, in 14 out of 18 instances in which such movements were made by parties of European troops, there was no further case after movement; in the other four instances the cases were limited to two or three. The experience of Native troops and prisoners in regard to movements was not always so favourable. In several instances many cases followed movement, but it would appear that, at least in some of these, the movement had not been sufficiently prompt, but had been delayed until many attacks had taken place, an error which ought not to have been made. Of sanitary defects noted in connexion with cholera, the following are recorded:—At Dum Dum, Nowgong, Sohagpur, and Secunderabad defective drainage; at Nowgong insufficient barrack accommodation, and on board ship at Mandalay impure water.

10. *Fevers.*—Fevers are returned as usual under the different heads of Intermittent, Remittent, Simple, Continued, and Enteric. The last is taken separately, and the others joined together as different forms of malarial fever. On this basis a statement is given by the Sanitary Commissioner in paragraph 27 of his Report, comparing the results of 1889 with those of former years in all the three presidencies. In all of them, as has been frequently remarked, the admission-rate under enteric fever has greatly increased. In Bengal in 1889 this reached 25, in Madras 16, and in Bombay 20 per 1,000. In 1880 the rates were 8, 2, and 9. Fevers as a whole have fluctuated much from year to year, and in Madras during 1889 there was a remarkable increase. The admission-rate (470) was higher than had ever been before recorded in this Presidency, though this high ratio has been frequently exceeded both in Bengal and Bombay. The high admission-rate of Madras in 1889 is attributed to the occupation of Upper Burma by Madras troops. Among them, as may be seen from Table XXIV., this rate was 861 per 1,000, a higher ratio than that of any other group. As regards mortality the results are still more unsatisfactory. In the Army of India as a whole the death-rate from all fevers during the ten years 1870–79 averaged 3·45 per annum, during the next ten years, 1880–89, it averaged 4·59, during 1888 it equalled 4·48, whereas in 1889 it rose to 6·92, of which .81 was ascribed to malarial fevers and 6·11 to enteric.

11. *Enteric Fever.*—In Table XXIII. a full view is given of the distribution of enteric fever among European troops all over India. In the Bengal Presidency 58 different places furnished cases; in fact, every cantonment returned one or more except Delhi. Over Madras and Bombay it was also widely spread. In many cantonments the cases were few, only one, two, or three throughout the year; in others the number was very large,—at Rawul Pindee and Sialkot 73 each, at Bareilly 95, at Lucknow 111, at Mhow 118, and at Secunderabad 162. At the hill station of Ranikhet there were 43, but the disease would seem to have been of a much milder type than elsewhere, for only three of them proved fatal. At Umballa the proportion of fatal cases was even smaller, only 5 per cent. At Belgaum it was 50 per cent., and at Mean Meer 53 per cent. These extremes call for some explanation. The experience of another year merely repeats what has been so frequently observed before, that young soldiers during their early years of Indian service are most prone to be attacked by enteric fever. Of every 100 soldiers attacked 64 were under 25 years of age, only 12 were over 29; 57 were in their first or second year of Indian service, and 20 more were in their third, fourth, or fifth year. Several interesting extracts are given from the reports of medical officers on this particular disease, but they throw no new light upon it. Certain insanitary conditions in some of the localities concerned are mentioned, which have, no doubt, been remedied. In several of these reports the milk supply is pointed to as the probable cause of the enteric fever, but this can only be said to be a suspicion, and it is a suspicion which, without further evidence, seems hardly warranted, for, as we have pointed out in reviewing former reports, if milk were the real cause, the children ought to be the greatest sufferers, whereas, as a matter of fact, they suffer very slightly. Among them during 1889, for example, the attacks equalled 5 per 1,000; among the women the ratio was 8, and among the men 22.

12. *The question of the Enteric Fever Bacillus.*—The Sanitary Commissioner makes the important announcement that a special bacillus called the *bacillus typhosus* has been discovered in certain Indian enteric cases. "The beginning has been made," he says, "of an important advance in the investiga-
"tion of the pathology of enteric fever in India. Through the kindness of Brigade Surgeon
"Hamilton, Surgeon-Major Knox, and Surgeon McGill, specimens of spleen and mesenteric glands
"from two cases were forwarded to a distinguished bacteriologist, Professor Bernhard, of Kiel,
"Germany, who reports that he found the *bacillus typhosus* in all the specimens. As the chief
"bacteriologists of Europe agree that the bacillus occurs in all cases of enteric fever and never in other
"diseases, the conclusion is now absolutely certain that at least some of the fatal fevers of India
"with intestinal lesions are identical with the enteric fever of Europe. . . . . The constant
"association of the bacillus with the disease makes it all but certain, in the opinion of the most able
"bacteriologists of Europe, that the bacillus is there the cause of the disease. If this be so in
"Europe it must be so also in India. Hence the source of *real* enteric fever in India must be
"looked for in the contamination of ingesta, and climate must be considered but a secondary
"influence." We shall watch the further progress of this investigation with much interest, but even if it should be established as an undoubted fact that this bacillus is special to enteric fever, and that it is the cause of the disease, it remains to be seen what practical steps can be taken to deal with it. We by no means undervalue scientific investigation; every addition to our knowledge is welcome, and must prove of value. We would only urge that too much importance should not be attached to

the supposed or even to the real discovery of a bacillus special to enteric fever, or any other disease. We have observed that such announcements do not tend to the advancement of general sanitary improvement which is of so much importance: once a disease is attributed to a bacillus or specific germ, there is too great a tendency to look on the matter as settled, and when any fresh case occurs there is nothing further to be done than endeavour to trace how the specific germ has been communicated, and in the event of such evidence not being found to assume that it has been conveyed in some unknown way. And as a further outcome of the same line of reasoning, endeavour is not unfrequently made to frame regulations to prevent its being imported in future regulations which are very apt to be impracticable and vexatious.

13. *Venereal Diseases.*—Passing over dysentery, diarrhœa, hepatitis, and respiratory diseases, which call for no special remark beyond what has been already said regarding them by the Sanitary Commissioner, we come to that unfortunately large and important group known as venereal diseases. There is no special table to illustrate this group, but the admission-rate caused by them in each cantonment will be found in one of the columns of Table XX. The history of these diseases has always been unsatisfactory, and in 1889 it was more unsatisfactory than it ever was before. In the Army of India, as a whole, they come next to fevers, and nearly equal them as the chief cause of admissions into hospital, and constitute one-third of the whole admission-rate of the year. How far they contributed to the constant sick-rate is not shown, but in this respect they probably rank even before fevers. In the different presidencies, taken separately, the results are all most unfavourable, those of Bengal being worst, then Bombay, and then Madras. The figures given by the Sanitary Commissioner in paragraph 39 of his Report show the admission-rates for a series of years, and whether the Army of India be taken as a whole or the presidencies individually there is the same lamentable result,—an almost continuous increase, culminating in 1889 in a maximum of 481 for all India, 491 for Bengal, 452 for Madras, and 481 for Bombay. It is remarkable not only that the rates for 1889 are so high, but also that the onward bound which they made in that year is far in excess of what has ever taken place previously; over all India this bound was 110 per 1,000; in Bengal 118, in Madras 76, and in Bombay 124. These statistics are so remarkable that we cannot help inquiring whether they have been prepared throughout on the same system, or whether some changes have been introduced which may account for at least part of the increase. The extent to which venereal diseases prevailed is, if possible, even more strikingly shown if the cantonments be taken separately. The range is very extensive, from 81 and 117 among small bodies of men at Taragarh and Attock to a maximum of 1,045 at Ahmednagar. In 26 of the cantonments the admission-rate exceeded the very large proportion of 600 per 1,000, and in many of them the excess was great.

14. *Venereal Diseases in relation to Lock Hospitals.*—These results are very much to be regretted. They represent an enormous amount of inefficiency due to one class of diseases, for the prevention of which special measures were long in force. The statistics and arguments of the Sanitary Commissioner all point to the conclusion that the very marked increase of these diseases is due to the withdrawal of these special measures of prevention, but before accepting this conclusion the facts must be very carefully considered. It is shown that in 1884, when lock hospitals were still in existence, the admission-rate from venereal disease among European troops in India was 291. In 1885 certain of these hospitals were closed as an experimental measure, but were re-opened in the early part of 1887, and the system was again in full force till September, 1888, when it was altogether done away with. In 1885 the ratio increased to 343 for all India, but it is to be noted that this was due to Bengal and Madras, and that there was some diminution in Bombay. The same occurred in 1886, when the ratio for India was 389. In 1887 Madras showed a slight increase, but, owing to diminution in the other two presidences, the rate for India fell to 361. In 1888 Madras showed a diminution of 24 per 1,000, but owing to increase in Bengal and Bombay, the rate for India rose to 371, and in 1889, as already stated, there was a marked rise in all three presidences, and the rate for India stood at the maximum of 481. The comparison is most unfavourable to the later years, but is the whole or even the greater part of this rise to be ascribed to the fact that the lock hospitals had ceased? The experience of previous years does not warrant this assumption, for, even during the continuance of lock hospitals, there was a decided increase in venereal disease. These hospitals existed for 18 years, from 1867 to 1884. The figures for the individual years 1870–79 are not given, but it appears that during these ten years the average annual admissions from venereal disease were,—for Bengal 209, Madras 198, Bombay 191, and India as a whole 203. In 1884, that is to say, after the lock hospital system had been in force for 18 years, the figures were,—for Bengal 291, Madras 307, Bombay 292, and India 294. Instead of a decrease there had been a marked rise, amounting roughly to about one-third in each Army. And what is still more worthy of notice is, that the statistics of 1866, before lock hospitals were established, are much more favourable than those of 1884, when these hospitals had been at work for 19 years. The figures of 1866, apparently, are not available for Bombay, but for Bengal they are 217 cases per 1,000 in 1866 and 290 in 1884, for Madras 236 in 1866 and 306 in 1884; or, if comparison be confined to the more serious forms of primary disease, we find that in Bengal the ratio rose from 64 in 1866 to 86 in 1884, and in Madras from 80 in 1866 to 101 in 1884. The Sanitary Commissioner would explain these remarkable results by "the greater "youth and inexperience of the soldiers, the smaller proportion married, and the more frequent and "extended movement of troops;" and it is to be borne in mind that the short service system came into force in 1870, and has been in operation since that time. Whatever degree of importance is to be attached to these causes of increase, the fact remains that the expectations of benefit to be derived from lock hospitals when they were established were very far from being fulfilled.

15. *Native Troops.*—The extent of invaliding, the causes to which it was due, the effects on European regiments of a tour of Indian service, the health of women and children, and the mortality

among officers during 1889, might all be commented on, but as these subjects have been fully discussed in the Report we shall pass on to the next section, which deals with the Native Army, and then return to consider the very important question of local defects existing in particular stations, in many of which both classes of troops are quartered. For the Native Army of India the statistics present no unusual features. The admissions into hospital, 1,003 per 1,000, the daily sick-rate, 35, and the mortality, 16·19, are much the same as they have been in former years. The lowest admission-rate (856) was in the Madras Army, and the highest in Bengal (1,115), Bombay occupying an intermediate place (1,024). The daily sick-rate in Bombay (32) was lower than that of Madras (36) or that of Bengal (37). In Bombay, also, was the lowest death-rate (10·74), and in Madras the highest (23·99), the Bengal rate being between the two (16·30). An examination of the Native troop series of tables shows clearly where sickness and mortality were chiefly localized. The troops serving in Burma suffered most. Among them the ratio of admissions was 1,363, the daily sick-rate 60, and the mortality 37·72; or, if the Chin-Lushai expeditionary force be included with the Burma statistics, the admissions equalled 2,011, the daily sick 75, and the deaths 46·78 per 1,000. How heavily some of the regiments in Burma suffered may be seen from the last section of Table XXVIII. For example, the head-quarters of the 32nd Madras Infantry lost by death 98 per 1,000; part of the 19th Madras Infantry lost 132, and another portion of the same regiment 211 per 1,000. In this last body of men the cases of sickness equalled 2,788 per 1,000. In an earlier portion of the same table it will be seen that unusual sickness and mortality in some regiments followed their return from Burma. The contrasts in the statistics of European and Native troops are very remarkable. As the Sanitary Commissioner observes:—"It will be seen how much less the Native soldier suffers from enteric "and simple continued fevers, hepatic affections, and venereal diseases, and how much more he suffers "from ague, dysentery, and pneumonia than his European comrade." The truth of this remark is strikingly borne out by the following figures:—

——	Intermittent Fevers.	Remittent and Simple Continued Fevers.	Enteric Fevers.	Hepatic Affections.	Dysentery.	Pneumonia and other Respiratory Diseases.	Venereal Diseases.
Admissions per 1,000.							
European troops	334	74	22	24	29	31	481
Native „	464	24	·2	1·6	55	41	38
Deaths per 1,000.							
European troops	·19	·62	6·11	1·48	·81	·56	—
Native „	1·11	·49	·07	·11	·90	3·14	—

It may be said, in short, that the European soldier dies in the hot weather in the plains of India of those diseases to which he is prone on being removed from a cold or temperate climate to a tropical one, while the Native dies in winter of those diseases to which he is prone (respiratory diseases) from cold when insufficiently protected by clothing, or subjected to overcrowding and defective ventilation, especially if he has a history of previous malarial disease.

The most marked contrast is that presented by enteric fever and venereal diseases. As regards the latter, it is worthy of notice, in connexion with what has been already said concerning this class of disease amongst European troops, that in all three Presidencies these diseases showed an increase also among Native troops. In Bengal they rose from 34 in 1884 (the last year of lock hospitals) to 42 in 1889; in Madras, from 22 to 30; and in Bombay, from 32 to 51; increases which in proportion are nearly as great as the increases which took place between those years among European troops.

16. *Sanitary Defects in Cantonments.*—Information as to the local causes of disease is to be sought for in the "Summary of the Annual Reports on the Cantonments in the Bengal Presidency for 1889," which appears in Section VIII., and also in the summary of sanitary sheets for the three Presidencies attached to the section concerning the Native Army. In both of these statements the admissions and deaths per 1,000 of strength at each place are entered side by side, with remarks regarding "sanitary defects, suggestions, improvements, &c." When sanitary defects are pointed out, there is generally abundant evidence to emphasize the need of their being remedied. Some of these defects are trifling, and might be put right at little cost; others, of more importance, seem to be brought to notice year after year without any advice being taken in regard to them. We can only cite a few examples of defects which call for remedy, with the remark that sanitary reports are of value in proportion to the amount of practical sanitary work they cause to be done. At Barrackpore, for instance, we have an admission-rate of 1,265 among Native, and 1,674 among European, troops. Among the former—and no doubt the evil effects extend beyond the immediate neighbourhood—it is said, "Sickness due chiefly to the swampy undrained condition of the lines, and the want of elevation "above the ground of the floors of the huts." Defective drainage and overcrowding appear in several places, and indeed, as respects Native troops, overcrowding is one of the most common defects

noted. Few evils are more serious, certainly there is no tendency in these reports to overstate the defects, rather the contrary, for we observe that in many places where both sickness and mortality were great no defects are mentioned. But, to proceed with examples, at Debroogurh surroundings are described as "swampy." Here and there it is said that ventilation was defective. At Sikkim, "surroundings very insanitary from want of proper latrine provision." In some few places fresh vegetables were scarce; in others, clothing too light for the cold; in others, as at Berhampur, "water very bad." At Bangalore the huts of the 25th Madras Native Infantry are described as badly constructed and ill-ventilated. At Trichinopoly the ventilation of all the Native huts is said to be defective. These examples are taken chiefly from the summary of Native troops sanitary sheets, which are, as a rule, more full than the Cantonment Sanitary Reports, but both might be made more complete and practically useful; what is wanted is to know, not the diseases which chiefly prevailed, for that information is already entered in the statistical tables, but the local causes of these diseases and the remedies which appear most suitable for the removal of these causes.

17. *Military Sanitary Works.*—In connexion with defects may next be noted the military sanitary works which were executed during 1889. They are recorded in Section VIII. The total expenditure on them during the year amounted to Rs. 60,74,202. They include accommodation for men and officers, hospitals, and miscellaneous work, such as roads. There does not appear to have been any expenditure on waterworks or other large scheme of improvement.

18. *Jails.*—In regard to the number of prisoners there are two points of some interest. The first is, that in all three Presidencies the average was greater than it was five years ago, and the second, that in Bombay this average is larger in proportion to the population than it is in Bengal, and very much larger than it is in Madras. These results are not peculiar to 1889, but are to be found in each of the years with which comparison is made. In 1889 there were 2·7 prisoners in Madras to every 10,000 inhabitants, in Bengal 3·9, and in Bombay 4·5. In 1888, in the same way, the figures were 2·5, 3·7, and 4·0. No explanation is given of this somewhat remarkable result. Section IV. of the Report is devoted to the sanitary history of the jails of India, and the general facts and figures are there so fully set forth as regards both sickness and mortality that we need not repeat them here at any length. They present no unusual features. The general admission-rate for all India (1,155), and the constant sick-rate (38), the deaths from cholera (4·52), and the deaths from allcauses (36·56), are almost identical with what they had been in 1888. A comparison of the three Presidencies shows that while the sickness was lowest in Madras it was there that the mortality was highest (39·49), the ratio for Bombay (31·36) being lowest, and that for Bengal (34·84) between the two. Taken according to Local Governments, the death-rate ranged between a maximum of 51·37 in the Central Provinces and 19·53 in Berar. For details on these and many other points reference must be made to the Report. We shall confine ourselves to noting the information given in the sanitary sheets of individual jails, taking as examples a few of those in which sickness or mortality, or both, were high, and seeing what has been said as to the local causes of bad health during the year. We shall omit those unhealthy jails in which the strength was small, because in dealing with small numbers there is always great risk of fallacy. In Bengal Proper we may select the following. Mymensing, admission-rate 1,341, death-rate 96·21. It is said there was slight overcrowding in certain wards for a short time, that antiscorbutic fresh vegetables were rather scarce in September and October, that water is scarce and not quite good during April and May, when the river is nearly dried up, and that the surroundings are low and marshy. At Chittagong, with 2,148 admissions and 131·43 deaths per 1,000, all that is noted in the way of defects is "ventilation in the vicinity of female ward defective, well water insufficient." At Cuttack, with 2,125 admissions and 88·56 deaths per 1,000, the only defects noted are that "the jail wells get low in the hot weather. The jail is in the "centre of the town, and the area of land enclosed by the walls is small for the number of prisoners "confined." At Midnapore, with 1,473 admissions and 77·89 deaths per 1,000, it is noted that "the food is defective in nitrogenous elements," but as the jail diet for the province is on fixed and carefully-prepared scales, such a cause, if it existed, would have much more than a local application. In the province of Assam, Sylhet jail, with 2,691 admissions and 66·88 deaths per 1,000, and Telikhal, with 2,917 and 73, were the most unhealthy. Regarding the last the column of defects is blank. In the first it is noted that "the prisoners are much exposed in the rains and hot weather in "extramural work." The North-Western Provinces and Oudh present very great extremes. The admission-rates varied from 244 at Ajmere to 3,144 at Banda, and the death-rates from 7·11 at Ajmere to 109·97 in the district jail at Allahabad. Regarding the last, all that is said is that there was slight crowding in the dormitories for abont a month in June and July. The Gorakhpur jail, where the deaths equalled 97·04, had been condemned by a special Committee. In many of the Punjab jails sickness was excessive, as may be seen from the following rates:—Amritsar, 3,272; Lahore Central, 2,840; Lahore Female, 3,732; Mooltan Central, 2,813; Peshawur, 2,366, and others that might be cited. In proportion the death-rate was low. In only two of them did it exceed 50 per 1,000; in the Lahore Central 50·33, and at Peshawur 68·97. In this last there was temporary overcrowding, and the same evil to a greater or less extent is mentioned in several of the other jails. The records of the Central Provinces are less favourable. Here, with a comparatively low sick-rate, the death-rate was in many of the jails very heavy. In eight of them it exceeded 50 per 1,000, reaching a maximum of 68·37 at Saugor. Here, it is said, "the sickness was attributable to climatic conditions." As we have already seen, in dealing with the Provincial Sanitary Reports, the public health in the Central Provinces during 1889 was very bad. The jails of Berar present favourable results, but in Burma, and more especially in Upper Burma, the reverse was the case. In Upper

Burma, so lately occupied, there were naturally many defects in the jails, and in many of them the great evil of overcrowding existed. The maximum admission-rate in the Madras Presidency was 1,470, at Rajamundry; in very few of the others did it exceed 800, but in several of the jails the mortality was heavy, 103·09 in the Central Jail, Coimbatore, 70·09 at Palamcottah, 70·44 at Trichinopoly, and 81·22 at Parvatipur. The Coimbatore rate includes 55 deaths from cholera. There the only defect noted is that "the water is extremely hard, and of bad quality." In only two of the Bombay jails did the admission-rate exceed 1,500. In most of them it was much less than 1,000, and at Surat it is entered as only 131. The highest death-rate, 77·51, was at Hyderabad, where also, as above shown, there was the greatest sickness, but the sanitary sheet makes mention of no defects. The above illustrations will show how very desirable it is that more information should be given in these sheets. They should be prepared with the greatest care, for the first step to sanitary improvement is to discover, if possible, the local causes of disease.

19. *The question of the Cholera Bacillus.*—We shall say nothing in this Memorandum of vital statistics or the history of the chief diseases or vaccination among the general population of India, because we have already discussed these matters in reviewing the Provincial Sanitary Reports. We would conclude by drawing particular attention to the present state of the question concerning Koch's supposed cholera bacillus. From the concluding paragraph of the Report we observe that Surgeon-Major D. D. Cunningham, as the result of further research, has come to the important conclusion "that in Calcutta cholera is associated with many different species of bacilli, and that, therefore, "Koch's theory of the existence of a single specific choleraic comma must be finally abandoned." So far Koch's bacillus, even if the position he claimed for it as *the* cause of cholera had been established, has not offered a basis for any practical sanitary work. We therefore merely note the stage at which scientific investigation has arrived, without any comment.

28th August 1891.

No. 2.

Memorandum by the Army Sanitary Commission on the Provincial Reports of the Indian Sanitary Commissioners for 1889.

Introductory Remarks.—As all the Indian Provincial Sanitary Reports for 1889* have been received in a body, it will be more convenient to deal with them in a single memorandum than to discuss each separately. The last Indian Reports reviewed by the Army Sanitary Commission were those of 1885, but the main facts recorded in those of the intervening years have been abstracted in the "Reports on Sanitary Measures in India" which have been issued by the India Office, Vols. XX., XXI., and XXII.

2. In the remarks which we have to make on these Reports we shall follow the standard order of subjects which has been prescribed for their preparation, and which has been generally observed in them. The facts have been already clearly stated either in the Reports themselves or in the orders upon them which have been issued by the Local Governments or the Government of India, and we shall endeavour to recall them only so far as is necessary for understanding the sanitary history of the year, commenting specially only on those points which seem either to have escaped notice or to require further attention.

3. *Vital Statistics.*—And first as regards vital statistics,—How far does any progress seem to have been made during the year in the collection of these most important data? What are the great general results which have been placed on record?

4. *Births.*—The registration of births is carried out in all of the provinces, and in all of them, with the exception of Bengal, it includes the whole or nearly the whole population. In Bengal it is limited to less than 2½ millions out of a total of over 65 millions of people. It is, in fact, confined to 137 municipal towns. Formerly it was more extensive, but the results were not satisfactory, and it was hoped that by limiting the registration to these towns more valuable data might be obtained. This expectation has not been fulfilled. A ratio of 22 births per 1,000 cannot be regarded as even approximating to the truth, especially when it is observed that the average for the towns in question is made up of individual rates varying from 52 in one to only three in another. The Lieutenant-Governor is of opinion that the results are very discouraging, and that it seems hopeless at present to attempt the registration in rural areas. In this opinion the Government of India reluctantly concurs, but begs that the matter may be further considered after the conclusion of the approaching census operations.

5. *Results in Provinces compared.*—We shall hereafter offer a few remarks on the general question of registration and the advisability or otherwise of restricting the areas in which it is to be carried out,

* Madras, Bombay, Bengal, North-West Provinces and Oudh, Punjab, Central Provinces, Burma, Assam, Coorg, Hyderabad.

but meantime introduce a statement to show the results in the other provinces, and how they compare with those of Bengal.

Province.	Population under Registration.	Ratio of Births registered per 1,000 of Population.	Number of Males to every 100 Females born.
Madras	30,885,771	30	104
Bombay	16,454,414	36	108
Bengal	2,422,994	22	112
North-West Provinces and Oudh	44,107,869	36	110
Punjab	18,842,264	40	115
Central Provinces	8,817,185	39	107
Burma	3,658,629	21	107
Assam	4,526,959	31	109
Coorg	178,302	16	103
Hyderabad	2,320,573	39	106

It will be seen that in all except Burma and the small province of Coorg, a birth-rate has been recorded considerably higher than in Bengal, a maximum of 40 being reached in the Punjab, and the next highest figure 36 in Bombay and the North-West Provinces. The Government of Bombay expresses the belief that in that part of India the true birth-rate cannot be under 45, and there seems to be good reason for this belief. It is dangerous to fix on any ideal standard of accuracy in vital statistics, especially in a country like India, where we have still to learn so much on the subject, but the very fluctuating birth-rates which compose the average figure for each province leave little doubt that the registration is still very imperfect. In the districts of Madras the range is between 42 and 18; in Bombay between 50 and 22; in the North-West Provinces between 50 and 25; in the Central Provinces, where the range is smallest, it fluctuates between 47 and 31. Nor do the towns, where most accuracy might be looked for, present any more trustworthy data. Ranges are to be met with between 54 and 10, 57 and 7, and even more remarkable extremes which might be cited. In every province male births were recorded in considerable excess of female births. Omitting Coorg, where the figures are little to be relied on, the number of males born to every 100 females born varied from 104 in the Madras Presidency to 115 in the Punjab. The excess of male births recorded is doubtless due in some measure to the importance attached to the birth of a boy, while the birth of a girl is looked upon as a matter for but little congratulation. Among some of the Punjab frontier people, the Sanitary Commissioner says, it is regarded as a positive disgrace. In Madras, Bombay, North-West Provinces and Oudh, the Punjab, and Burma, the reported births exceeded the reported deaths by from 4 to 8 per 1,000. In the other provinces the deaths exceeded the births by from 1 to 6 per 1,000. These figures merely represent the averages for the provinces as a whole, and an examination of the details for the different districts in each shows that these averages are made up of considerable extremes. Into these, however, we shall not enter. We need only add with regard to the birth statement given above that the population is according to the Census of 1881. No allowance is made for any probable increase during the intercensal years, because there are no materials for arriving at any sound conclusions on this point, and until more accuracy has been attained in registration such refinement is uncalled for.

6. *Deaths in Provinces compared.*—We turn now to the deaths, and introduce a statement to show the recorded mortality in each province:—

Provinces.	Ratio of Deaths per 1,000 of Population.		
	Males.	Females.	Total.
Madras	24	22	23
Bombay	31	31	31
Bengal	26	22	24
North-West Provinces and Oudh	32	29	31
Punjab	31	32	32
Central Provinces	46	40	43
Burma	17	16	17
Assam	32	29	30
Coorg	21	24	22
Hyderabad	43	41	42

The population under registration in all the provinces is the same as that already shown in the statement for births, with the one exception that in Bengal the deaths, instead of being confined to towns with an aggregate population of somewhat under 2½ millions, were registered over the whole population, amounting to 65,859,534. In this statement, as in other places, we omit decimals, as they imply an accuracy not yet attained in the registration, and the additional figures needlessly complicate the comparison. We observe that the mortality in the different provinces varied enormously, from 17 per 1,000 in Burma to 42 in Hyderabad Assigned Districts, and a maximum of 43 in the Central Provinces. In several of the others, which occupy an intermediate place, there is evidence to

show that the year was more unhealthy than usual. In Madras it was regarded as more unhealthy than any year since 1879. In Bombay also it was exceptionaly unhealthy, and the same remark applies in a minor degree to Bengal. In the North-West Provinces and Punjab although there is no marked excess in the recorded death-rate, parts of them suffered severely. But, as already mentioned, it was in the Central Provinces and in the Hyderabad Assigned Districts which lie adjacent to them that the people suffered most. In the Central Provinces the year is described as most unhealthy. The Chief Commissioner remarks indeed that "the province has never passed through a more trying year." In the Assigned Districts of Hyderabad the death-rate rose from 24 in 1888 to 42 in 1889, but it is to be remarked that in 1887 it had been 45, a remarkable illustration of the extraordinary variations in Indian rates of mortality, indicative of the decidedly healthy or unhealthy character of particular years. This phase of Indian sanitary history is by no means new to us, but we may here call special attention to it, because it has an important bearing not only on Indian statistics, but also on other matters of practical moment.

7. *Extremes in Provincial and Local Ratios.*—If the death-rates of each province be taken separately, and the district ratios which make up the provincial average be compared, very marked extremes are to be found, and though these may be taken in some measure to be evidence of neglected registration in parts, they are undoubted evidence also of extreme unhealthiness in others. In the Madras Presidency, for example, the district rates vary between 40 in Ganjam and 15 in Nellore. In Ganjam the mortality of 1889 rose to 40 per 1,000, having been only 17 in 1888. Here and in adjoining districts, both of Madras and Bengal, the results were due to famine, which, in spite of all the efforts of the Government to counteract it, brought in its train of privation and distress a terrible amount of sickness and death, recorded chiefly under the head of cholera and fevers. In the towns of the Madras Presidency the range was from 57 to 15. The Bombay Presidency shows even more remarkable contrasts than this, for in the towns the mortality varied between 75 and 14, and in the districts between 45 and 15. The Sanitary Commissioner shows the death-rates in each registration circle of which the districts are composed, so that easy comparison may be made by all the authorities concerned. The more such results are localized the more likely is the registration to be effectively checked, and the more valuable will the data be for practical sanitary work. The Sanitary Commissioner for Bengal ascribes the increased death-rate recorded in that province to improved registration, but although this may be true to some extent, the fact would appear to be that the year was, in at least part of the province, more unhealthy than usual. This is particularly true of the Orissa Division, where, as already stated, the same distress and privation existed as in the neighbouring district of Ganjam, and cholera and fevers recorded a very large number of deaths. In the Poori district of Orissa the death-rate equalled 45 per 1,000, or 5 more than the death-rate of Ganjam. In Balasore, another district of this division, it equalled 38. In Mozufferpore, on the other hand, the district rate was only 16. Other provinces show very marked contrasts in their district rates,—in the North-West Provinces and Oudh between 55 and 21; in the Punjab between 42 and 17; in the Central Provinces between 60 and 32; in Burma between 28 and 10; in Assam between 37 and 24; and in Hyderabad from 49 to 38. Nor are the differences in the town rates less marked. In Bengal such extremes appear as 71 and 5; in the North-West Provinces 81 and 13; in the Punjab 50 and 40; in the Central Provinces 89 and 18; in Burma 72 and 19; in Assam 78 and 21; and in the Hyderabad Assigned Districts 64 and 24.

8. *Excess of Male Deaths.*—As regards sex, it will be observed that in Bombay the death-rate among males and females was the same; in all the other provinces, except the Punjab and Coorg, the male exceeded the female deaths. In the Punjab the excess of female deaths formed the subject of special inquiry, and the result, it is to be feared, would seem to be that the excess was due either to deliberate infanticide or neglect of female infants.

9. *Lamentable Mortality among Children.*—The mortality among children, and especially among infants under one year, as recorded in the statistical tables furnished from the different provinces is very high, and in many of them appalling. Here are the figures for 1889. Although infant mortality in India is undoubtedly high, it is to be hoped that some of these ratios have been arrived at either by errors of registration or errors in the census population on which they are based.

Provinces.	Mortality among Infants under One Year Old.	
	Males.	Females.
Madras	167	140
Bombay	251	219
Bengal	189	154
North-West Provinces and Oudh	312	280
Punjab	253	242
Central Provinces	430	374
Burma	124	93
Assam	201	174
Hyderabad	317	270

10. *Suggestions for Improving Registration of Births and Deaths.*—Imperfections and shortcomings in the registration of both births and deaths are freely admitted on all hands, and we are glad to see that

persistent endeavours are being made to improve the system. It would be easy to point out many manifest discrepancies in the figures, particularly in those provinces where vital statistics are most backward, but we are well aware of the vast difficulties that have to be dealt with, and we are glad to observe that both the Local Governments and the Government of India are fully alive to the importance of overcoming them. We would make only two suggestions with a view to aid in this object. 1st. That in order to test the registration more use should be made of the vaccination staff. In Hyderabad we observe that the Native Superintendents of Vaccination in their tours are required to examine the registers, and see if the entries accord with the information regarding births and deaths which they can easily obtain from the inhabitants they may converse with on the spot. If this plan were generally adopted good results might, we believe, be obtained. 2nd. The Sanitary Commissioners should show in their Annual Reports, not only the district averages, but also the registration circle ratios of which these averages are composed, both the birth ratios and the death ratios, so that the local bodies may compare these results with those of other and especially neighbouring places. This is already done in some of the Reports, more particularly in the Bombay Report, and the example might be followed with advantage.

11. *The true place of Vital Statistics in Sanitary Work.*—It is to be prominently borne in mind that the collection of vital statistics is only a means to an end, and that end the sanitary improvement of the localities to which they refer. Until the excess deaths and the causes of such excess deaths are brought out side by side the people cannot be made alive to the vast importance to them of sanitary reforms, or in other words of the practical action required to remove such causes. Defective as they are, Indian statistics have supplied most valuable information on many points of interest, and more particularly on the history of epidemics. On these and other matters there is still much remaining to be learnt, and to this end nothing can be more valuable than a careful record of vital statistics. Such accurate information is indispensable. There is always more or less danger that the means taken to improve the registration may tend indirectly to encourage statistics which, though they may appear correct, or nearly correct, when compared with European standards, are in reality far from being so. They should on no account be worked up to any ideal standard of probable birth or death rate, nor should local authorities be judged to be attentive to their duties in this matter in proportion to the high ratios which they record. From what we have said it will be seen that the statistics of selected areas, whether of births or deaths, will but partially attain the practical end in view, and that endeavour should therefore be made to extend the registration in every case over the whole province.

12. *General Causes affecting the Health of the People during the Year.*—Before discussing the chief diseases under which the deaths of the year have been recorded, we may glance shortly at the general causes which appear to have influenced the results, especially in those parts of India in which the mortality was heaviest. These general causes natural divide themselves under the two great heads of meteorology and the prices of food. In some of the Reports the information under both these heads is scanty. The separate section "meteorology" is one reserved for the Report of the Sanitary Commissioner with the Government of India, but it is always open to the Local Sanitary Commissioners in the section containing "General remarks" to give information on these points which have such a vast and direct bearing on the health of the people. These matters are fully dealt with in the Madras Report. In that Presidency the rainfall was as a whole above the average, and the excess was most marked in the districts of South Canara, Ganjam, Vizagapatam, and Malabar. Of these districts Ganjam only suffered severely, with a death-rate of 40 per 1,000. In Malabar it was only 16. In the prices of food there was a marked increase in many of the districts, especially in Ganjam. Here and in the neighbouring parts as has been already mentioned, the people suffered much from privation, and deaths among them were frequent from this cause. The Sanitary Commissioner for Bengal observes that the month of April was unusually dry and hot, this excess in some districts amounting to as much as 8 degrees. Food also was dearer than usual. The Sanitary Commissioner of the Punjab draws attention to the increased rainfall in certain districts which suffered much from fevers, and to this reference will be made hereafter. According to Chart E which he appends to his Report the price of none of the staple foods was unusually high. Most of the District Reports in the Central Provinces speak of the high price of food grains. From Raipur the facts are summarized in these words:—"The last year's crops were very poor, both the *rabi* and *karif*, and those of the "previous year were scarcely any better. Owing to the scarcity of food, the drought, in consequence "of the great heat of the hot months, and the delay in the monsoons, the poorer classes were "reduced to great straits, and lived upon anything they could get (dried mohwa flowers reduced to a "paste and baked, various berries and fruits; the dried 'bair' fruit, for instance, was eaten, boiled with "salt), and were thus more liable to disease." As a whole the rainfall was above the average. In the Hyderabad Assigned Districts the price of food was much dearer than the average of the previous five years. The information, as we have already stated, is scant, but there is ample evidence to show that over many parts of the country the conditions both as regards meteorology and the food supply were such as to be decidedly unfavourable to health. In future reports we would suggest that succinct data should be given under each of these heads, so that the facts may be compared with the vital statistics of the year. The facts should not only be stated clearly and succinctly, but it should be distinctly shown in what respect they differed from those of other years, and what is the opinion of the Sanitary Commissioner upon them. The precise form in which this should be done might perhaps be prescribed by the Government of India, for one uniform method would greatly facilitate comparison between the different provinces. We would only observe that in such an investigation averages are a fallacious mode of comparison, and that it would be much more satisfactory to give the actuals for a

few selected districts than to deal with the averages of whole provinces. We would add also that in records of rainfall it is essential to consider, not only the total quantity during the year, but also its distribution both according to place and according to time.

13. *Mortality recorded under different Heads.*—Before taking up the history of the chief diseases during the year, let us glance at the details of the mortality in each province as shown in the Standard Table of the Vital Statistics Series No. VI., in which the deaths are arranged by towns and districts under the great heads of cholera, small-pox, fevers, bowel complaints, injuries, and all other causes. The results are thus summarized:—

Provinces.	Ratio of Deaths per 1,000 of Population.						
	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	All other Causes.	Total.
Madras	2	1	8	1	·4	10	23
Bombay	2	·4	21	3	·3	5	31
Bengal	2	·1	16	·8	·4	3	24
North-West Provinces and Oudh.	1	1	23	1	·6	4	31
Punjab	·1	·4	22	1	·3	7	32
Central Provinces	6	2	23	3	·5	9	43
Burma	·9	·7	8	·8	·2	6	17
Assam	4	·5	16	3	·4	6	30
Coorg	·05	·1	18	2	·3	2	22
Hyderabad	4	·7	18	6	·4	12	42

Decimals are to a great extent left out, and the totals therefore do not quite correspond with the details, but this is a matter of little consequence, and does not interfere with the comparison we desire to make. It will be observed that, although the ratios differ much both in the total and minor columns, in all the provinces with the exception of Madras, fevers take the first place, and account for half, or even more than half, of the whole deaths of the year. In Madras the first place is taken by "all other causes," and the fever-rate is much lower than that of any other province except Burma, where the same ratio, 8 per 1,000, is recorded. In all of them, except Madras, "all other causes" take the second place. The next highest ratios are 6 per 1,000 from cholera in the Central Provinces, and from "bowel complaints" in Hyderabad; and then follow four from cholera in Assam and Hyderabad. The other ratios are comparatively trifling.

14. *Comparison of Town and District Mortality.*—Before leaving this Table VI. in the Reports we may note how the recorded mortality affected the towns as contradistinguished from the country. In Madras the population of the two is mixed up, so that proper comparison cannot be made between them, and the population on which the rates are calculated, moreover, includes Europeans and Eurasians, whereas European and Eurasian deaths are not included. Both are sources of error which ought to be eliminated from future Reports. If the town and district rates be compared they are found to stand thus:—

Deaths per 1,000 of Population.	Madras.	Bombay.	Bengal.	North-West Provinces.	Punjab.	Central Provinces.	Burma.	Assam.	Coorg.	Hyderabad.
In towns	28	33	25	34	37	43	34	40	22	40
In districts	23	31	24	30	31	43	14	30	22	42

In the Central Provinces and Coorg the rates are the same in both. In Bengal the town rate is 1 in excess of the district rate. In Bombay the excess is 2, in this North-West Provinces 4, in the Punjab 6, in Assam 10, while in Burma the town rate is more than double the district rate, 34 contrasted with 14, a difference indicative of much defect in the registration. In Hyderabad, and this is the only exception to the general rule, the town rate is less than the district rate. In Table VI., already referred to as one of the series attached to each Report, comparisons may be made of the town and district mortality under each head, but into these details we need not enter.

15. *History of the Chief Diseases. Cholera.*—The history of the chief diseases in all the Reports deals first with cholera. We shall state the main facts of prevalence or exemption in each province, and then consider the sanitary defects or other causes to which the disease is attributed. In the Madras Presidency, during 1889, 76,020 deaths from cholera were recorded. With one exception, the mortality under this head was higher than had ever been registered before. It averaged 2·7 for the Presidency as a whole, whereas in 1877, the one exception referred to, the rate was 12·2. The year 1877 is memorable for the wide-spread famine, and the same calamity with similar results attended the year under review, though fortunately in a much more limited degree. It was the cholera death-rate in Ganjam and adjoining districts that chiefly caused the high average for the year. The general incidence of the disease is very clearly seen on the map, which is specially designed to illustrate the cholera of the year, and there it will be found that the districts divide themselves into the following groups. First, Ganjam, with a cholera death-rate of over 14 per 1,000; secondly, Vizagapatam and Godavery, with between 5 and 6 per 1,000; thirdly, South Arcot, Tanjore, and Madura, with between 3 and 4; fourthly, Bellary, Kistna, and North Arcot, with between 2 and 3 per 1,000; and, fifthly, the remaining districts, where the rates were under 2. But although the violence of the epidemic was confined to a few districts and to a few months the disease was widely spread over the Presidency both as regards time and place. Every month shows several thousand deaths from this cause. Every district records some, and 13 out of the total of 22 record them every month. We have thus, as usual in the history of cholera, an area of greater or less epidemic intensity, and other parts where though the disease was unmistakably present, for a long period it was comparatively quiescent. As usual also, even in the parts where the epidemic was most severe it was singularly localized. The great proportion of the villages escaped, neighbouring places, moreover, suffered in very varying degree. To these facts in their bearing on all the provinces reference will be made in a subsequent paragraph.

16. *Cause of Prevalence in Madras.*—The Sanitary Commissioner observes that the cholera, especially in Ganjam, was a good deal confused with famine diarrhœa and other diseases consequent on low vitality. "In consequence of the prolonged drought the people were in a semi-starved state "for months, and in parts of the district the drinking water was more impure than usual, because "in consequence of the drought it was much reduced in quantity, and therefore had a larger per-"centage of suspended and dissolved impurities. The disease was present in the district before the "food dearth was felt, but it was aggravated by the wandering habits of the famine sufferers, by "the resort to strange and unnatural articles of diet, and by the use of contaminated water; in "fact, all the normal insanitary conditions of Native life—bad feeding, bad housing, bad conser-"vancy, and bad water—were all intensified by the distress which prevailed." A more detailed examination of disease causes in particular localities will be reserved until we have considered not only cholera, but the other main heads of mortality.

17. *Cholera in the Bombay Presidency.*—The account which is given of the cholera in the Bombay Presidency is purely statistical, and the facts concerning it may be briefly summarized. The average death-rate recorded under this head (1·97 per 1,000) fell little short of the rate in the Madras Presidency, but particular parts suffered much less than those of Madras. The epidemic in no district was so violent as in Ganjam. The disease was more or less present in every district, but in very varying degree, ranging between a maximum of 5 in Bijapur to a mere fraction represented by four deaths in the Upper Sind frontier. The areas occupied and the death-rate which cholera caused in each are shown on the map, but a somewhat different plan has been followed from that adopted in the Madras Presidency, and a comparison between the two Presidencies is thus rendered more difficult than it would have been if one uniform method had been adhered to. As will be seen hereafter, the same difficulty is met with in the cholera maps of other provinces. Speaking generally, it may be said that in 1889, cholera was widely over the Bombay Presidency, but that its severity was confined chiefly to the districts in the south-east and east which border on the Madras Presidency, on Berar, and on the Central Provinces. In the north and west the severity was less. But although this is generally true, it is to be observed that individual towns and rural circles suffered much in districts which contribute comparatively little to the general average. The rural circle which recorded the highest cholera death-rate (12·86) is situate in the Kurachee district, and the town circle which suffered most—the very high ratio of 24·41—is in Khandesh. It need only be added that every month cholera contributed several hundred deaths, and that in July it reached its maximum of over six thousand.

18. *Cholera in Bengal, and Causes to which it is ascribed.*—The Sanitary Commissioner of Bengal illustrates the relative intensity of the cholera in each district of that province by a striking diagram, in which Poori stands out prominently with no less than 21 deaths per 1,000 from this cause alone, Balasore with 14, and Cuttack with 8. These three districts, which constitute the Orissa division, are continuous with that portion of the Madras Presidency in which, as has been already shown, the people suffered so much. In the Purneah district the ratio equalled 10, in Backergunge 5, in Fureedpore, Khulna, and Darjeeling it was between 3 and 4, and in all the others under 3. There can be little doubt that the inhabitants of Orissa were labouring under the same unfavourable general causes which were proving at that very time so fatal to the people of Ganjam, but no mention is made of these, and the terrible mortality is ascribed primarily to the arrival of pilgrims. From the annexed statement it will be seen that, in the first three districts named, which belong to Bengal, the epidemic followed very similar laws of increase and decrease. A sudden marked rise in April, still

further increase in May, a maximum in June, falling in July till October, when a minimum was reached, and then a slight rise again in the two last months of the year.

—	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Balasore -	120	240	350	1,917	3,649	4,199	1,479	307	23	6	360	345
Cuttack -	28	58	118	876	2,708	4,231	3,366	925	349	279	1,202	747
Poori -	13	10	211	1,837	4,346	6,896	3,647	611	190	114	340	454
Ganjam -	28	58	115	3,367	4,209	3,218	2,040	701	54	35	84	23
Vizagapatam	—	—	43	258	750	2,175	2,999	734	84	15	4	3
Godavari -	—	11	154	308	856	2,697	3,381	1,980	230	61	8	—

And the same great features are to be found in the three other districts which belong to Madras. It is impossible, with these facts before us, especially as they have been collected from two different and altogether independent sources, to avoid the conviction that these great results are not to be accounted for by any accident or series of accidents, but that they must be in the main dependent on powerful general causes or combination of such causes. What these are we cannot say. We can deal only with the local conditions which favour them. Most serious sanitary defects at Poori are brought to notice, especially in the pilgrims' unwholesome food, and in the polluted water of which they drink. Of these defects special notice is taken by the Bengal Government, and the Government of India expresses a hope that steps may be taken to remove them. Mention is made of other insanitary conditions, but the one most frequently pointed out is polluted water, though some of the reporters seem to be of opinion that this alone is not sufficient, and that in all probability the cholera germ had found its way into the supply. It is very desirable that sanitary officers should deal with all such matters in a practical way; that they should describe the defects which clearly exist, leaving mere probabilities out of the question. From a sanitary point of view the remedying of these defects is the great work to be done, in so far as it can be thoroughly accomplished. The best means will thereby have been taken to prevent a recurrence of the evils which have previously arisen from neglect. In several places in Bengal the prevalence of cholera is ascribed to its having been imported by people dispersing from fairs or travelling from one place to another, but in no instance is sufficient evidence adduced to establish this view. Nor if it were established would any practical benefit be gained, but rather the reverse, for to attempt to regulate the movement of over 65 millions of people in a country covering so large an area, and in every part of which cholera is more or less present during every month of the year, is a task which could hardly be attempted in earnest. And certainly if it were attempted it could only end in failure. We think it of great importance that sanitary officers should bear this in mind, so that their attention and efforts may be directed to those causes of disease which are evident, and which at the same time can be practically dealt with.

19. *Cholera in the North-West Provinces and Oudh.*—The same remarks apply to much of that portion of the Report of the Sanitary Commissioner of the North-West Provinces and Oudh which relates to cholera. Human agency is the great cause to which the prevalence of cholera of 1889 is attributed, and little is said of local insanitary causes which admit of remedy. The outbreak of cholera in the district of Kumaon, where the disease attained a maximum mortality of 14 per 1,000 the same as in the famine-stricken Madras district of Ganjam, is believed to be traced to a pilgrim from Poori. It may be observed in reference to this story that, with the single exception of Dehra Dun, every district in the North-West Provinces returned deaths from cholera, and that the province, as a whole, was not free from it during a single month in the year. The practical question to be answered is, Why was the mortality from cholera so high in Kumaon? The only information supplied on this point is contained in Appendix 4, where, although few places are specified, and no comparison is drawn between local conditions and cholera prevalence, some general facts are recorded regarding the condition of the district. It is mentioned that the people "are very dirty, and subject "to ophthalmia and skin diseases, no arrangements for the disposal of excreta, offal, and of the dead "bodies of men and animals when large numbers die from any cause." Cattle are frequently kept in the lower rooms of the people's houses, these houses overcrowded, drainage often obstructed by refuse and manure heaps. The only item in fact of which anything good can be said is the water-supply, which in the majority of the villages was far from habitations, and tolerably safe against pollution, but the Deputy Sanitary Commissioner who writes the Memorandum adds, "excepting in the rainy season and during the prevalence of epidemic sickness." This last clause is not fully understood, and, seems to require further explanation, but whatever this may be there is ample evidence to show that the condition of the people of Kumaon is very favourable to epidemics, and this opinion is borne out by the history of Mahamurree, a form of plague which has on more than one occasion caused so much mortality among its inhabitants, a disease which seemed born of local insanitary conditions, which, so far as we are acquainted with the facts, is explicable by no theory of importation, and which was singularly localized in those hill tracts in which the insanitary conditions existed. After Kumaon, Lalitpur, in the far south-west corner of the province, suffered next, and then the Tarai, at the foot

of the Kumaon hills. In none of the other districts did the cholera death-rate equal 3 per 1,000, and of seven it was merely fractional.

20. *Cholera in the Punjab.*—As we advance further and further to the north-west the cholera of 1889 diminishes in prevalence. Over the whole Punjab the death-rate from this cause equalled only ·15 per 1,000. In many districts no deaths were registered from it at all, and the highest rate in any one of them was only ·89 in the district of Rohtak. The Sanitary Commissioner is of opinion that "in all probability" the disease was carried from the Native State of Alwar to Rewari, but no proof could be obtained in support of this opinion. He further expresses his belief that "in "consequence of the railway system in the Punjab the facilities of communication between distant "parts of the province are much greater than they were a number of years ago, and that probably is "the reason why the disease made its appearance almost simultaneously in places widely separated "from each other." There is not even a *primâ facie* case against the railways in this matter, not a tittle of evidence to show that the distribution of cholera since their development has been altered from what it used to be before they came into existence. Ever since epidemics of cholera have been studied at all, the fact that cases have occurred simultaneously, or almost simultaneously at widely distant points has attracted attention. The question of the influence of railways on the distribution of the disease, both in India and Europe is one which has been carefully investigated, and so far the evidence goes to show that they exercise no influence whatever, that cholera travels no faster than it did before, and that its distribution as respects both time and place is in no way affected by them. Any facts which appear to throw light on this and other of the many difficult points connected with cholera deserve careful investigation, but a mere surmise is of little value, especially when it is opposed to past experience. In connexion with an outbreak of cholera in a village of the Delhi district, a description is given of two wells which were much polluted, a type it is feared of many others all over the province.

21. *Cholera in the Central Provinces.*—In the Central Provinces cholera was very prevalent, and the mortality occasioned by it very great. On the whole population this equalled nearly 6 per 1,000, but the provincial ratio is made up of widely differing details. In each of the three districts of the Mahanadi division it exceeded 10 per 1,000, while in the Chanda district of the Wainganga division it attained the maximum of nearly 14 per 1,000. In the district of Nimar, on the other hand, according to the tabular statements, not a single death from cholera was registered during the year, but in the body of the Report it is said that 197 fatal cases occurred, a discrepancy which requires explanation. Many other differences occur in the figures cited from the Civil Surgeon's reports, as compared with those in the Sanitary Commissioner's statistics. "Many Civil Surgeons," the Sanitary Commissioner remarks, "refer the origin of the disorder to importation by human intercourse from "places said to be suffering from cholera, but to its almost simultaneous appearance in many centres "in a district, there is no satisfactory explanation given, nor is the strange exemption of certain areas "environed by cholera considered and discussed." Of the sanitary defects noted in connexion with particular outbreaks the most common is the unsatisfactory condition of the water-supply, but this is not constant, and instances are adduced in which where the water was well reported of the people yet suffered much. On this point the Chief Commissioner observes, "It is impossible to say that either "bad water or bad sanitation were sufficient of themselves to cause an outbreak, for the Chief "Commissioner, from his own inquiries on tour, can confirm the fact, which is noted by several "Medical Officers, that very dirty villages, with a bad water-supply, often enjoyed an absolute "immunity, while the disease raged in better villages on all sides of them. But there can be no doubt "that when cholera once fastened on a foul village it dealt more hardly with it than with one that "had a good water-supply and a fairly clean site. On the whole, what evidence there is goes to "show that the best preventive was the possession of a comparatively pure water-supply, and this is "in accordance with experience all over India. There is, as already stated, little doubt that the "epidemic was, to say the least, greatly aggravated by the exceptionally bad state of the wells and "tanks in many districts during the hot season of 1889."

22. *Cholera in Burmah and Coorg call for no special remark.*—Passing over British Burma, where there is nothing deserving of special notice concerning cholera, except that the disease was less prevalent than usual, and also over Coorg, where nine deaths occurring in the month of January make up the whole cholera mortality of the year we may next consider the facts regarding Assam. In this province the increased death-rate of the year is in the main ascribed to the greater prevalence of cholera,—of the nine districts all suffered,—the minimum death-rate from this cause being ·39 in the hills, and the maximum 8·95 in the district of Darrang. The Sanitary Commissioner expresses a strong and oft-repeated opinion that this lamentable result, the death of 18,288 persons during the year, or a loss of more than 4 per 1,000, the whole population of the province, is due to the importation of the disease by coolies coming to the tea gardens from Bengal, and says: "A more strict segregation "of cholera cases, or of suspected coolies before their entrance into Assam, by the Agents, of the "Bengal Government, affords the only hope of lessening this tendency to occasional increased "importation of cholera poisoned coolies, supported by careful watchfulness at Dhubri." Little or no evidence is adduced in support of these assertions, which seem opposed to the whole history of cholera as shown in the tabular statements, the persistency of the disease, month after month, the concurrent rise and fall in the different districts, and the small proportion of villages attacked, even in those parts of the country which suffered most. The Sanitary Commissioner proposes in future to collect evidence in support of his views, but we should much regret if the study of sanitary statistics in Assam should lead to no more practical a remedy against cholera that an attempt to bar the entrance of disease by quarantine, an attempt which, as we have already said in regard to Bengal, could only prove a failure, because it would be attempting an impossibility. We are glad to see that the Sanitary Commissioner

himself believes that other and powerful means can be had recourse to for attaining the end in view, for speaking of cholera in the Nowgong district, and the comments made upon it by the Civil Medical Officer, Mr. McNaught, he observes: "It is evident from his remarks that what is required to prevent "or lessen this unusual mortality in the future is suitable improved sanitation and better drinking "water sources." In this view we entirely concur, and believe that by acting on it much more can be done to diminish cholera and all other diseases than by the most stringent measures which could be adopted towards incoming coolies.

23. *Cholera in Hyderabad.*—The history of cholera in Hyderabad is very striking, especially when compared with the statistics of previous years. In 1888 only 305 deaths from this cause were registered. In 1889 the number was 10,925. The disease was fatal in every district during nearly every month of the year, and the loss it caused varied from a maximum of 11 per 1,000 in the district of Basim to a minimum of 2 in the district of Buldana. The comparison which is drawn between the results of 1889 and those of previous years extends back to 1868, and the contrasts presented are very remarkable. In 1873 not a single death from cholera was registered over the whole province, in 1878 the number was 34,306. No reference is made to local causes favouring outbreaks. The Sanitary Commissioner remarks that, on examining the cholera mortality month by month along with the temperature and rainfall over a series of years, it would appear that "the disease usually commences "with a rise in temperature, and increases coincidentally with the rainfall and saturation of the "soil."

24. *Proportion of Villages attacked in each Province.*—No review of the cholera history of the year would be complete without reference to the columns of the Statement No. VII. of the Standard series which are devoted to the statistics of villages. Making ample allowance for inaccuracies in registration, and also for the fact that the figures include only deaths, the record is very remarkable. The general results are as follows:—

Madras	of 44,452	villages	7,684	were attacked.
Bombay	„ 24,535	„	2,831	„
Bengal	„ 234,369	„	26,548	„
North-West Provinces and Oudh	„ 105,421	„	6,700	„
Punjab	„ 35,527	„	340	„
Central Provinces	„ 28,249	„	4,293	„
Burma	„ 15,075	„	1,258	„
Coorg	„ 517	„	4	„
Assam	„ 15,947	„	3,038	„
Hyderabad	„ 5,567	„	817	„

Or if the comparison be confined to those districts in each province in which cholera attained its maximum, the results are still very striking:—

Provinces.	District.	Cholera Mortality in District per 1,000 of Population.	No. of Villages.	
			In District.	No. attacked.
Madras	Ganjam	16·0	7,174	1,151
Bombay	Bijapur	5·78	1,139	361
Bengal	Poori	21·01	5,166	3,031
North-West Provinces	Kumaon	14·10	5,151	1,212
Punjab	Rohtak	·89	488	49
Central Provinces	Chanda	13·71	1,599	351
Burma	Mergui	7·44	200	95
Assam	Darrang	8·95	1,674	322
Hyderabad	Basim	11·1	945	260

In every case the proportion of villages that escaped is larger, in most instances it is several times larger, than the proportion that suffered. The results, borne out as they are by the more exact statistics of troops and prisoners in India, are not merely of scientific interest, but also of great practical importance. They show that cholera is a disease which is singularly localized, and that the great practical work to be done for its prevention is the removal of all local causes of disease, so far as this can be accomplished.

25. *Suggestions for a Standard and improved Map to illustrate Cholera.*—It would greatly facilitate the study of cholera in these sanitary reports if one standard plan of map were adopted in all of them. At present there is no uniformity. In some the map is so large and unwieldly as to be most inconvenient, in another the province is cut up into several small maps. Some of the maps are very rough, and so covered with figures as to be almost unintelligible. Some are not shaded to show the areas of relative prevalence, others are shaded, but the groupings of districts according to the death-rate vary, and the shadings do not correspond. We would suggest that one plan of map should be adopted by all the provinces, and that this plan should provide for the following requisites:—

(*a.*) Convenient size, such for example as that employed in Madras or that employed to illustrate vaccination in Bengal.

(*b.*) That it should include the whole province, and not only a part of it.

(*c.*) That the different shadings adopted should be representative of certain fixed ratios of cholera mortality.

(*d.*) That whatever may be shown on it in the way of large towns, rivers, railways, &c., the main object should be to convey to the eye at a glance the principal facts of comparative prevalence or exemption in different parts of the province. It seems impossible compatible with this great object to show the dates of first cases as was originally intended when a cholera map was first instituted.

26. *Comparison of Small-pox in different Provinces.*—From the figures already given in paragraph 13, it has been seen that the provincial death-rate due to small-pox varied in 1889 from a minimum of ·1 in Bengal and in Coorg to a maximum of 2·0 per 1,000 in the Central Provinces. In the Madras Presidency it equalled 1·0—somewhat higher than it had been in 1888, but less than the average of the previous five years. The only two districts in which the disease can be said to have been specially severe were Ganjam and Kurnool, in both of which it caused a mortality exceeding 4 per 1,000. In the former, as already mentioned, the circumstances of the year were specially favourable to epidemics, and in the latter there were more than ordinary difficulties in persuading the people to accept vaccination. "A most severe epidemic small-pox," writes the Civil Surgeon, "swept the district." The mortality registered under this head exceeded 4 per 1,000. With vaccination in all the provinces we shall deal in a subsequent paragraph, but we may here observe that, in the town of Kurnool, the deaths from small-pox equalled 2 per 1,000. Only nine municipalities show a more unfavourable small-pox death-rate. The 45 others show a more favourable death-rate; in eight of them no death whatever was recorded from small-pox. Yet in the ratio of successful vaccinations to population, Kurnool takes the first place—116 successful vaccinations per 1,000 Vizagapatam, which heads the list of mortality with 6·7, had only 51 successful vaccinations per 1,000, and some of those municipalities which recorded no deaths from small-pox take a very low place as respects successful vaccination. This information is taken from a statement given by the Sanitary Commissioner at p. 29 of his Report. We draw attention to it not in order to undervalue the protection afforded by successful vaccination, but to show how necessary it is to consider all the facts, and to take them not for one year only, but for a series of years. Very probably the increased activity of the Vaccine Department in Kurnool took place towards the end of the year, and was a direct result of the small-pox epidemic. It only remains to note regarding the Madras Presidency that 61 per cent. of the total small-pox mortality was recorded in children under 12 years of age. In the Bombay Presidency the small-pox mortality was nearly double what it had been in 1888. During the ten years for which statistics are given, the fluctuations are very striking. In 1881 only 539 deaths were ascribed to this cause, in 1884 the number was 14,438, in 1889 it was 7,066. Of the deaths in 1889, 75 per cent. were among children under 12. The district ratios present no very remarkable extremes, the highest recorded being 1·94 in Karachi. Every district throughout the Presidency recorded deaths from small-pox in every month of the year. There was no severe epidemic outburst in any particular place. In Bengal also small-pox showed increased activity over 1888, but the total deaths recorded (8,665) contrast favourably with the decennial mean (13,607), and still more so with the annual maximum in 1881 (24,371). The highest district mortality was registered in Poori, bordering on the Madras district of Ganjam, but the deaths here fell far short of their proportion in Ganjam, and equalled less than 1 per 1,000. Seventy per cent. of the total small-pox deaths occurred in children under 12. Although the average death-rate from small-pox in the North-West Provinces was only 1 per 1,000, the mortality in certain districts was high, as, for example, in Hardoi with 8, Barabanki with 5, and Sitapur with nearly 5 per 1,000. These three districts are in Oudh. In some of the towns a much higher ratio was reached, notably in Hardoi, where it attained the maximum of 17. In Oudh the people are more adverse to vaccination than in other parts. Of the total small-pox deaths in the North-West Provinces nearly 60 per cent. were recorded among children under 12. Contrary to the experience of the provinces already mentioned, the history of the Punjab as regards small-pox during 1889 was favourable. The deaths were less than one half of what they had been in the year previous, and little more than half of the average of the previous five years. In only three of the districts did the mortality equal 1 per 1,000. The only local outburst of any violence which is referred to occurred in Peshawur towards the end of the year. Children under 12 contributed more than 80 per cent. of the whole mortality. It is to be noted that in Column 7 of Vital Statistical Statement No. VIII., which is specially devoted to small-pox, the Sanitary Commissioner of the Punjab has altered the standard form, and has given the number of children "*over one and* under 12 years of age." The words in italics have been added. The original intention evidently was to include all children under 12 in this column. The matter is not of material moment except in this respect, that the same method of calculation should be employed in all the Reports. Small-pox was more fatal in the Central Provinces than it had been since 1879. The Bilaspur district heads the list with a ratio of 5, and next comes Nagpur with 4 per 1,000. The Sanitary Commissioner, in noting the remarkable variations in the mortality in different years, observes: "The periodical increase "of small-pox is not adequately explained by the fact that inoculators are at work, or that the "people themselves resist vaccination, for these factors are constant." The columns of age already referred to seem to have been filled in on the same principle as in the Punjab, although the headings remain unaltered, for while the number of children "under one year" who died from small-pox in the Central Provinces is entered as 7,598, the number "under 12 years" is only 7,117. The correct number under 12 would appear to be the sum of the two, or 14,715. This would give the proportion of small-pox deaths "under 12 years" as over 80 per cent. of

the total at all ages. Although the small-pox death-rate in Burma (·77) compares favourably with that of several of the other provinces in 1889, it presents a large increase on the ordinary ratio due to this cause. Of the previous 17 years only two show a larger mortality from small-pox. In one of the townships during 1889 it attained a maximum of 5 per 1,000. Children under 12 make up 60 per cent. of the total deaths of the year. As a whole Assam was singularly free from small-pox, the great mass of the deaths from this cause, 2,060 out of the provincial total of 2,245, having occurred in the one district of Sylhet. This result is attributed to inoculation. It would be interesting to know if the practice of inoculation is confined to this one district, and also whether inoculation was had recourse to more commonly in 1889 than in other years, when the small-pox deaths in the district were comparatively few. The mortality among children under 12 throughout Assam was 46 per cent. of the whole. As the death-rate from small-pox in Coorg is the equivalent of only 19 deaths, no remarks need be made regarding this small province. In the Hyderabad Assigned Districts the small-pox mortality was more than double what it had been in 1888, it equalled ·7 per 1,000. The Sanitary Commissioner notes that the towns are more opposed to vaccination than the rural districts, and that in the towns the greatest mortality from small-pox occurred, a remark which agrees with the experience of the Sanitary Department in other parts of India. In Hyderabad the proportion of small-pox deaths in children under 12 was 52 per cent. of the whole. The very high proportion of the deaths among children in all the provinces is a fact in the history of small-pox which calls for special remark.

27. *Comparison of the Mortality from Fevers in different Provinces.*—We come now to that very large portion of the death-rate which is recorded under the head of fevers. In the Madras Presidency the proportion of such deaths was unusually heavy, but it varied much in different parts, from a maximum of 19 in the Kurnool district to only 1 in Tanjore, and among municipalities from 21 in Kurnool to 1 in Palamcottah. In the Vizagapatam district it equalled 18, and in Ganjam 16 per 1,000. The Sanitary Commissioner is of opinion that "a principal cause of the increased mortality "from fevers in 1889 was doubtless the heavy rainfall which occurred in some districts, producing "a water-logged condition of the country," and that, with special reference to the high ratio in Ganjam, "the condition of the poor was also such that they more easily fell victims to diseases "like malarial fevers." But, high as was the death-rate recorded under this head in Madras, it will be seen from the comparison made in paragraph 13 that it was much lower than in any other province except Burma, where also it was 8 per 1,000. The next lowest rate is 16 in Bengal and Assam, and from this with slight gradations it attains a provincial maximum of 23 in the Central Provinces. The minor prevalence of malarial fevers in Madras as shown by these figures quite accords with the more exact statistics of troops and prisoners, which show that in the more northern parts of India malarial fevers are more common than in the south. In the Bombay Presidency, 1889 was a year of fever prevalence; in 20 out of the 24 collectorates the fever death-rate was higher than in 1888, and also compares unfavourably in this respect with previous years, but no special cause is assigned for this result. In the Bengal Report a diagram is given with the view of comparing the annual mortality from fevers over a series of years with the annual rainfall, but it is clear that annual averages of either mortality or rainfall for so large a province can afford no data for drawing sound conclusions. These averages may be made up, and no doubt must be made up, of extremes of years during which fevers were very prevalent in certain parts and slightly prevalent in others, of years during which in the same way the annual rainfall was sometimes very heavy and sometimes very light. If these variations were always more or less constant for particular areas, they would not so much matter; but the area of fever prevalence in one year may be the area of comparative exemption in another, and the district which records an unusual amount of rain in one year may be suffering from drought in another. It would be much better, therefore, as we have before remarked, in all such inquiries to deal with the actuals of particular places than to trust to averages, which must be more or less fallacious guides. The Sanitary Commissioner records his opinion that "the want of proper drainage of the soil is the principal cause of the great "prevalence of malarial fever in Bengal;" and adds that, "as a rule, fever is most prevalent in "districts where drainage is worst." In illustration of this, he cites the case of the district of Shahabad, where the marked increase of fevers of late years is ascribed to canal irrigation, interference with drainage, and consequent water-logging of the soil. Similar remarks are made regarding the district of Sarun. It is to be observed that the fever death-rate of Shahabad during 1889 is returned as 20 per 1,000, whereas in Sarun it was only 9, and it is also worthy of notice that in the district of Poori, with the maximum district mortality from all causes of 45 per 1,000, fevers contributed less than 4 of this total. The recorded fever death-rate in Poori was, indeed, less than that recorded in any other district of Bengal, a fact which, as the Lieutenant-Governor remarks, needs explanation. In the North-West Provinces and Oudh the fever death-rate, 23 per 1,000, varies from a maximum of 45 in the Tarai to a minimum of 10 in the Gorakhpur district. The Sanitary Commissioner is at some pains to point out that the death-rate under the head of "fevers" is grossly exaggerated, and this he endeavours to prove by comparing the statistics of the Native population with those of European and Native troops and prisoners, and also with the details of English death-rates. But as the Government of India has already pointed out, the figures are in no way comparable. It would, indeed, be extraordinary if the composition of the death-rates of England bore any relation to those of India in respect to malarial diseases, which are almost unknown in England, but which, unfortunately, prevail with greater or less intensity in every district of India. That the Indian statistics are by no means strictly accurate as respects the causes to which the deaths are ascribed we are quite prepared to hear, and nothing else could be expected

from the non-professional and illiterate agency by which the registration is carried out; but such errors, although they would be important in scientific discussions, need not in the least interfere with the great practical work of the Sanitary Department, which is to discover the local disease causes which are associated with a high death-rate, and to suggest the best means of dealing with them. In the Punjab, also, fevers were more prevalent than usual. The Sanitary Commissioner gives some interesting data, which seem to connect unusual prevalence in certain parts with increased rainfall, and comparative fever exemption with diminished rainfall. Some of the districts in the Rawalpindi division and on the frontier suffered most, the fever mortality in two of them amounting to 33 per 1,000. We are glad to observe that in the orders on this Report the Lieutenant-Governor remarks that "every effort, therefore, should be made, by schemes of drainage and sanitation, to reduce this "high mortality, and save the people from a disease which must greatly deteriorate the physique and "energy of the population." The record of fevers in the Central Provinces during 1889, as we have already said, gives the very lamentable mortality of 23 per 1,000, the highest of any province during the year. In all the districts it was high, much higher than usual. In the Saugor district it reached a maximum of 34 per 1,000. The two main causes producing these results were also widespread over the province, heavy rainfall and the low vitality of the people consequent on the dearness of food grains. Hyderabad also shows unusual fever mortality, but neither here nor in the Reports of the other provinces already mentioned is there any special information as to the causes operating unfavourably in 1889. In nearly all of them the widespread influence of malaria, and its baneful effects in sapping the strength of the people and ultimately contributing in very large measure to the death-rate, is spoken of as a matter regarding which there can be no dispute.

28. *Mortality from Bowel Complaints in the different Provinces.*—As already shown in the statement given in paragraph 13, the provincial death-rates ascribed to bowel complaints vary greatly from ·8 in Bengal and Burma to no less than 6 in Hyderabad, which is twice that of any other part of India. The extremely high ratio of mortality recorded under this head in Hyderabad has attracted attention in former years. Taking the details given in the Reports, it is found that the district ratios in each province vary in a remarkable degree. In Madras, for example, Vizagapatam shows only ·4 per 1,000, while Madras shows 7·5. It is further deserving of notice that those districts which suffered most from cholera or privation, and in which a high death-rate from bowel complaints would naturally be expected, are not the districts where it is found. On the contrary, as above stated, Vizagapatam, which suffered much from cholera, has the minimum rate for the province, and in Ganjam, where the maximum cholera mortality occurred and the pressure consequent on the high price of food was most felt, the deaths from bowel complaints equalled only ·5 per 1,000. No explanation is given of these discrepancies. There would seem to be no explanations possible, except inaccuracy in the registration. The Sanitary Commissioner remarks that "in Parla-Kimedi, where "there was distress no deaths from bowel complaints were recorded, notwithstanding the intimate "relation there is between food supplies and bowel complaints." We observe from the Madras Government's orders on this Report that, in accordance with instructions issued by the Government of India, deaths from bowel complaints will hereafter be recorded under the head "dysentery and diarrhœa," and this change may tend to secure more exact data. The registered mortality from bowel complaints in the Bombay Presidency during 1889 was higher than usual. The local ratios show extremes just as inexplicable as those of Madras. Not less remarkable are the results in Bengal, where the urban ratio is over 3, and the rural ratio under 1 per per 1,000. Of the districts in the North-West Provinces and Oudh, Gonda returns a minimum mortality of ·11, and Gurhwal a maximum of 10·44. In the Punjab the range of mortality recorded under this head is more circumscribed, the maximum district ratio being 3, and the minimum ·1. The Central Provinces return their mortality from bowel complaints as nearly 3 per 1,000, an average composed of district rates varying from 6 to ·3. Sickness of this kind was unusually prevalent, a result which, in the Sanitary Commissioner's opinion, quite accords with the fact that the year was one of widespread cholera, and of distress arising from the high price of food. In Burma bowel complaints caused less than half the number of deaths they did in the previous year. A more detailed examination of the district returns for the two years, with a view to explain this marked difference, would have been interesting. With reference to the high death-rate from bowel complaints in Hyderabad, the Sanitary Commissioner observes that their seasonal distribution was similar to that of fevers, the maximum being registered in August and September, and the minimum in January and February. This accords with the general experience of other provinces. In 1878 the death-rate from bowel complaints in Hyderabad reached a maximum of 12, in 1872 it was 10, in the other years from 1868 to 1889 it varied between 2·9 and 9·5.

29. *Deaths from Injuries in the different Provinces.*—The information regarding deaths from injuries, so far as the standard tables are concerned, is confined to certain columns of Statement VI., in which the proportion of deaths recorded under this head per 1,000 of population is entered for each district and town of the province, also the number of deaths recorded as due to suicide, wounds and accidents, snake-bite, and wild beasts. From the annexed summary of these results we see that the average loss so registered varied from ·2 in Burma to ·6 in the North-West Provinces. This was the maximum. In none of the provinces was there any great increase in the death ratio attributed to injuries except in the North-West, where there was an excess of 1,027 over the total of the previous year. Of the suicides females are nearly always more numerous than males. And this result seems, in most of the Reports, to be the one anticipated. In the four provinces, however, which come last in the statement, the reverse is the case, and the males are in excess of the females. In

Assam, where this excess is very marked, the Sanitary Commissioner is of opinion that it "might have been expected."

Provinces.	Suicide.		Wounds and Accidents.	Snake-bite, and killed by Wild Beasts.	Total.	Ratio of Total per 1,000 of Population.
	Males.	Females.				
Madras	1,061	1,831	6,768	2,846	11,506	0·4
Bombay	260	351	4,029	1,301	5,941	0·36
Bengal	1,125	2,016	15,796	11,787	30,724	0·46
North-West Provinces and Oudh	764	2,243	17,032	7,077	27,116	0·61
Punjab	142	187	4,871	1,181	6,381	0·34
Central Provinces	384	409	2,995	1,372	5,160	0·58
Burma	33	27	308	290	658	0·18
Assam	81	25	1,354	375	1,835	0·41
Coorg	11	5	42	9	67	0·37
Hyderabad	111	99	633	229	1,072	0·4

We have entered into this subject at greater length than we otherwise should have done, because, although deaths from injuries are not preventable, in the same sense that deaths from disease are preventable, they afford illustration of the difficulties attending registration, and we believe that they might also be usefully employed as a special test of the correctness of the registers. Even ignorant people can tell whether a person was generally supposed to have died of a wound or committed suicide, or had fallen a victim to a snake or wild animal, and thus, by comparing the record of such entries with the information to be picked up by inquiry on the spot, a fair estimate may be formed of how far the registration is to be depended on. Such extraordinary entries as 474 suicides in the Nellore district of Madras, 628 deaths caused by wild beasts in the Mozufferpore district of Bengal, 1,012 deaths by wounding and accident in the Gorakhpur district of the North-West Provinces, 540 deaths ascribed to the same cause in the Raipur district of the Central Provinces, and others which might be cited, suggest grave doubts as to the accuracy of the record in respect of the causes to which the deaths were really due.

30. *Local Insanitary Conditions, Madras.*—We come now to consider the information contained in these Reports regarding the disease causes to which the deaths of the year were chiefly ascribed. Of great general causes we have already made some mention. What we desire now to ascertain are the local insanitary conditions of different localities. This important subject is very variously dealt with by the Sanitary Commissioners. The Madras Report contains three statements in which it is referred to. One is an "Abstract of Sanitary Reports of Municipalities," in which the headings of the columns run thus:—Municipality, Area in Square Miles, Average Population per Square Mile, Sanitary Works, Water-supply, Drainage, Conservancy, and General Health. Particulars under these heads are given concerning 55 municipalities. An abstract in the same form follows for the 21 local fund circles, and after that another statement called an "Abstract of the Sanitary Estimate of Villages " in each of the Registration Circles from which Reports were received." This includes 124 registration circles. The form would appear to have been prescribed by the Government of India, but it is not given in all the Reports, nor in those in which it is given are the headings precisely the same.

In the towns the Sanitary Commissioner says that the sources of water-supply are chiefly tanks, wells, rivers, canals, and irrigation channels. Generally speaking, there is no regular system of drainage, the drains being simply side cuttings for surface drainage only. The masonry drains which exist in a few towns having been badly devised and badly kept are more of a nuisance than a boon. Generally both the water-supply and drainage of the greater number of towns are far from satisfactory; cesspools still abound. In the villages the same evils exists in an intensified degree, in so far that very few have any scavengering establishment at all, only 746 out of a total of 42,862 in the Presidency. These figures give some idea of the vastness of the sanitary problem to be dealt with.

31. *Local Insanitary Conditions, Bombay.*—The information regarding sanitary defects in the Bombay Presidency is contained partly in the prescribed sanitary estimate of villages and towns inspected by the Deputy Sanitary Commissioners and Civil Surgeons, and partly in another tabular statement which forms Appendix IV. This embraces 154 municipalities. In Section X. of the Report, also defects, at certain places inspected by the Sanitary Commissioner during the year are brought to light.

In many of them it is evident that water-supply, drainage, and conservancy are all in an unsatisfactory state—the common condition of most Indian villages, and still also of many towns.

These inspection notes give all the information desired, and the Sanitary Commissioner's meeting with the municipal authorities and pointing out to them on the spot the evils amidst which they live, and also the means by which these evils may be removed, is calculated to do much good and lead to marked local improvements. As examples of such defects which the Sanitary Commissioner points

out, we may mention defects in the drainage of the Marine lines, Bombay, which is necessarily dependent on the general system of drainage being carried out for the city. It would appear that the drains have not been laid on a concrete foundation, a precaution which ought to be taken, especially where, as in this case, the subsoil is waterlogged for several months every year. The Sanitary Commissioner brings to notice that, in many municipalities, the amount spent on "road watering" and "road cleaning" is considerably in excess of the amount spent on conservancy proper, and urges the greater importance of the last item, in which opinion we concur. At Poona he notes the defective drainage, the imperfections of latrines, and the dangers to which the existing system of water distribution is exposed. At Sholapore, where the unsatisfactory state of the conservancy attracted attention, he recommends that the night-soil should be "buried in deep pits," and this recommendation is repeated at Nasik. We doubt the wisdom of this method of disposing of night-soil, even when earth is daily sprinkled into the pit as he suggests. Shallow trenches with abundance of earth are much to be preferred, and the ground should afterwards be cultivated. The entries in the tabular statements are too cursory and vague to be of much use in ascertaining either what are the special local insanitary conditions of particular places, or what measures are called for in each to remedy them.

32. *Local Insanitary Conditions, Bengal.*—For some account of sanitary defects in Bengal reference may be made to Appendix V., containing the "Sanitary Estimate of Villages." This statement includes only a few of the rural circles, regarding which no information was available for the previous year's Report. There are still some to be added to the list, and when the whole is completed it will, as the Sanitary Commissioner observes, be of much use to the new Sanitary Board of the Province.

The entries now added give a fair idea of the ordinary defects of Native villages,—the drainage more or less imperfect and often of the worst description, a water-supply practically undefended and liable to all manner of contamination, and a conservancy which either exists only in name or does not exist at all. In the Sanitary Commissioner's very interesting and instructive Reports on certain municipalities, copies of which are appended to the Report, there are excellent illustrations at once of the prevailing dangers and of the great need for removing them in the interests of the public health. "In most of the districts of Bengal Proper," he observes, "the greatest and most pressing want is "good drainage. In Behar the want of good drinking water is most severely felt." Of Mozufferpore he writes: "The natives of Mozufferpore obtain their supply of drinking water from wells, of which "there are a very large number in the municipality, many of them having been provided for the benefit of "the poor by the munificence of the residents of Mozufferpore and its neighbourhood. I am sorry to "say that these wells have in recent years been shamefully neglected, and allowed to get into a dis-"gustingly filthy condition by those whose duty it was to keep them free from pollution. In many "instances they are surrounded by house drains, a large portion of the contents of which undoubtedly "finds its way by percolation, and in some instances trickles direct into the wells," &c. A typical case of this well-pollution is given where a foul drain, running close beside the well, ended in a cesspit also within a few feet of it. "From the drain, but more particularly from the cesspit, which was a heaving "mass of crawling maggots when I saw it, emanated the most disgusting and overpowering stench "it is possible to conceive." What he says of Patna is most instructive, showing as it does not only the terribly insanitary conditions in the midst of which the inhabitants live, but also how difficult it is to deal with evils which exist on so large a scale, and which are so bound up with the every-day habits of the people. "Almost, if not quite, as necessary as a good drainage system for the improvement of the "sanitary condition of Patna is the closing of the well-privies, or *sundases* as they are called, with "which the town abounds. I was shocked to learn that there are upwards of 20,000 of these "abominable contrivances scattered over the municipality. Apart from the sickening smell which "they emit, nothing could be more deleterious to the health of the inhabitants of the town than to be "living in the concentrated essence of such an atmosphere as surrounds these privies. I am aware "that the use of well-privies is a time-honoured custom with the poorer classes of the people of this "country, and that chiefly on that account it would be difficult and a hardship to at once abolish "them altogether. I do not, therefore, suggest that such a drastic measure should be taken, but "what I do recommend is, that no new well-privy should be allowed to be dug, and that those that "already exist should be gradually closed and filled up with clean earth." Mr. Gregg appears to have been well received by the municipal authorities in all the places which he visited, and the system he adopted of explaining fully the existing dangers and the great benefits to health to be derived from improvements, and so endeavouring to enlist their intelligent and active co-operation, is no doubt the best that can be adopted, and in due time must produce excellent results.

33. *Local Insanitary Conditions, North-West Provinces and Oudh.*—The Sanitary Commissioner of the North-West Provinces succinctly describes the condition of the municipal towns in an abstract which tabulates in successive columns the population of each, its birth and death rate during the year compared with other years, the quality and sufficiency of the water-supply, the state of the drainage and conservancy, and remarks regarding its most pressing sanitary requirements. A glance at this statement shows very clearly and forcibly the great defects which more or less exist in all of them. Dr. Hutcheson thus summarizes the general results of this survey:—"The potable water as taken "from wells (and in the North-West Provinces wells are by far the most common source of supply) "is liable to pollution from the mode of drawing the supply, and the habit of washing the person, "clothing, cooking utensils, &c. at or upon the platform of the wells, and from percolation from a "polluted and contaminated soil caused by defective drainage and irregular conservancy arrange-"ments. Drainage is everywhere defective. In some towns a system obtains with fairly good "outfalls, but in most towns the drains are irregularly constructed and in many instances the outfall "is into tanks in the centre or populated parts of the town. In many towns the house and latrine

" drains communicate directly with open surface drains, scarcely, if ever, or very irregularly and in " very few instances regularly flushed, so that nearly the whole of the urine and a certain portion of " the excreta pass into street and lane drains to undergo fœtid decomposition. The foul water of " private latrines and sullage water are intercepted in some towns and removed at irregular intervals " in properly constructed carts in some places, and in defective wooden barrels in other places, the " latter method causing and perpetuating daily nuisances along thoroughfares. Conservancy on the " dry earth plan is carried out systematically in a few towns, as in Lucknow and Meerut, with a " great measure of success, but everywhere private conservancy arrangements are inadequate. . . " . . . In other towns there are few or no latrines, and the inhabitants resort to open spaces " within their own area or to fields in the immediate outskirts of the town. The inadequacy and " irregularity of private conservancy arrangements in large towns tend to aggravate and perpetuate " nuisances and endanger health."

34. *Local Insanitary Conditions in the Punjab.*—The local conditions in the Punjab which are unfavourable to health are of much the same character as those which have been already described in the North-West Provinces. To indicate them, therefore, involves repetition, but so long as they exist attention cannot be drawn to them too often. It is with them that the Sanitary Department in each province has to deal, and they should on that account receive careful and prominent attention in every Sanitary Report. The facts concerning them in the Punjab are summarized in the statement which forms Appendix A. of the Provincial Report. This statement embraces 143 municipalities and 441 thanas or rural circles, and regarding each of these it gives the population, the death-rate from small-pox, fevers, and bowel complaints, particulars regarding drainage, water-supply, and conservancy, and in the case of municipalities the receipts and expenditure under this last head. We have already referred to similar statements in the other Reports, but this is more full than any we have yet noticed, and with some slight alterations we should like to see it generally adopted. It is of great practical importance that the sanitary condition of each locality should be recorded, and especially the defects in this condition, and it is also of great practical importance that these defects should be considered side by side with the death-rate in that locality. It would, however, be better to give the total death-rate in each case instead of only the death-rate recorded under a few heads. So long as the statistics of diseases to which the deaths are ascribed are so imperfect the total of mortality from all causes is the great fact to be dealt with. The figures in this Punjab statement afford but an imperfect view of the case. For example, the details for Hissar town sum up only 16 deaths per 1,000 of population, but the total recorded mortality equalled 29. In the same way, the items regarding Delhi city sum up only 29, but the year's mortality in this city equalled 48 per 1,000, and so on with many other places that might be cited. A column should also be added to show what was done during the year to remedy the evils in each locality. Speaking of these evils as recorded in the statement for 1889, we may observe that, although many of the places appear to enjoy good natural drainage, for the most part the drainage is more or less imperfect. In not a few the ground is low and swampy and the neighbourhood subject to inundation or completely water-logged during the rains. The water-supply, even where it is naturally good and sufficient, is subject to great risks, and is frequently polluted beyond all doubt. In many places the conservancy arrangements are described as 'very bad." An entry regarding the villages in the Jullundur district runs thus:—" Except in the towns " and larger villages no system of conservancy of any kind is in force. All the villages, without " exception, are extremely filthy." Other places are more favourably reported of, but there is ample evidence to show how serious and general are the defects in drainage, water-supply, and conservancy.

35. *Local Insanitary Conditions in the Central Provinces.*—Of defects in the Central Provinces the Sanitary Commissioner has comparatively little to say. Incidental reference is made to them as already mentioned in his remarks on the history of the chief diseases, but the only attempt at systematically recording them is in the statistics given at page 30, in which the death-rates from small-pox, fevers, and bowel complaints are compared with the condition of the drainage, water-supply, and conservancy in each town and rural circle. Here, as in other provinces, these death-rates do not by any means afford a sufficient estimate of the existing dangers, for the total mortality is often double, and more than double, the sum of the ratios entered under the few headings named. The data, moreover, regarding the condition of each locality are but scant. Many places have no remarks opposite them in respect of this condition, and in others such general remarks as "fair," "good," "indifferent," "bad" contain all the information to be had. The wells, tanks, and streams from which the water is supplied are, as a rule, subject to pollution, and there are many entries of villages being dirty, and other signs of very imperfect conservancy.

36. *Local Insanitary Conditions in Burma.*—The local insanitary conditions which have to be dealt with in Burma are detailed in the reports of the Health Officers of towns and in the memoranda of the Deputy Commissioners, both of which have been summarized by the Sanitary Commissioner. A few illustrations from the first of these will suffice. At Akyab, the wells are liable to contamination. At Kyaukphu, every house is provided with a cesspit. At Pegu, most of the wells and tanks are near some such sources of contamination as latrines and cesspits; sullage from the houses generally stagnates in the drains on the roadsides. At Tharrawaddy, "cesspits exist in nearly every house, " they are used till they become objectionable, when they are closed and a fresh pit dug." At Myanaung, it is noted that each house has its own cesspit. At Moulmein, the supply of water is bad and very inadequate, "the open drains, except during the rains, are little better than receptacles of " filth." At Tavoy, it is said, "every Burmese house has its cesspit, these are never cleaned or " covered over." The Sanitary Commissioner observes that "the abolition of cesspit privies within " populous centres and the introduction of sewage farming are sanitary reforms which call for early " solution. The fact that jail gardens are so productive, even though in many instances the land was

" originally poor, is due to the manurial agency of ordure and other prison refuse which is carefully " conserved for the purpose," and this experience is sufficient testimony to the value of the soil now much worse than wasted in cesspits. The cesspit nuisance is certainly an evil which urgently requires to be dealt with in Burma. From every point of view, conservancy, water-supply, and drainage, it is full of danger.

37. *Local Insanitary Conditions in Assam.*—The Sanitary Report for Assam contains no systematic account of the local insanitary conditions either in the towns or rural circles of that province, but in the notes on the several municipalities incidental mention is made of them here and there. Such entries for example occur. At Gauhati, it is said, "There is not the slighest use in wasting money " on the present system [of water-supply]. With the river bank so polluted as it is, and with the " water source below the town, as it exists, nothing but disastrous unhealthiness can result." At Dibrugarh, "a good system of deep drainage is much wanted both for the civil and military stations." In Sylhet "there is great difficulty in obtaining good drinking water, and its want is very keenly felt " by numerous residents." At Sibsagar "the conservancy arrangements are not so satisfactory as " they ought to be." At Nowgong "the private latrines are in many instances very defective and " foul." No doubt many defects have been brought to notice in previous Reports, and it may have been thought unnecessary to repeat the information, but, as we have already said, it is essential that it should be repeated year after year so long as the description holds good, because the municipalities and other authorities concerned are thus brought face to face with the fact that local defects do exist, and that, in the interest of the public health, it is essential they should be remedied as far as possible. A clear and forcible statement of these defects, given side by side with the mortality statistics of the year, would take up but little space.

38. *Local Insanitary Conditions in Coorg.*—The Civil Surgeon of Coorg, who furnishes the Sanitary Report, remarks, as the result of his inspection of a number of places, that "the chief points " that require attention are increased means for the removal of filth and refuse matter, and an " improved water-supply." He says that "the villages in North Coorg, especially those along the " river in the direction of Seringala, were noted to be in a most insanitary condition. Cattle and " human beings were found crowded together in the same buildings, the floors being saturated with " cow-dung and urine, while the lanes were simply open sewers." At Fraserpet "the river water, " which is principally used, is open to contamination at all spots. The bed and banks are used for " the purposes of nature, and in May last I saw people collecting drinking water from the very spot " on the bed of the river where they had just passed urine."

39. *Local Insanitary Conditions in Hyderabad.*—The "Sanitary Estimate" in the Hyderabad Report refers to the condition of the drainage water-supply and cleansing of towns and villages, but the references are very brief. More detailed information on these points is given in the summary of the Municipal Reports which appears in Section IX., and in the Sanitary Commissioner's notes which are printed in the Appendix to his Report. A few extracts will suffice to show existing evils. At Amraoti "the drainage of the town is bad; water accumulates all over the place, causing much public " annoyance and danger to health." Owing to deficient rainfall, the water in the reservoir of the newly constructed works was not expected to last the hot weather. If it failed the people must draw from wells mostly brackish, or from a much polluted small stream. At Basim the water-supply is insufficient, and no proper system of drainage exists. At Akot most of the people resort to the fields, and, though special places have been set apart for the purpose, it is difficult to induce them to go to them. At Shegaon most of the wells are brackish. At Akola the river water is defiled, and most of the wells are brackish. At Kholapur "the house sinks were in a filthy condition, manure and refuse " are accumulated in the yards of private houses, and the surroundings of the town were foul smell- " ing and filthy. . . . There are many well-privies which ought to be done away with. . . . " They foul the earth, the air, and the water, and are a constant source of disease."

40. *Sanitary Improvements effected in Madras.*—The Madras authorities are fully alive to the importance of sanitary improvements. It is noted that the scheme for supplying the town of Cuddapah with a good and sufficient water was far advanced. No new works of any importance had been commenced during the year, but projects for the water-supply of Adoni, Dindigul, Madura, Negapatam, Salem, Tanjore, Tinnevelly, and Trichinopoly had either been sanctioned, or were being matured, and drainage schemes for Kumbakonum, Cotacamund, Negapatam, and Salem had been sanctioned. The drainage scheme for Vellore was under consideration. Greater care was being exercised to guard the drinking water supplies from pollution. A very important step had also been taken in appointing a Sanitary Engineer, whose special duty it is to advise local bodies in regard to schemes of sanitary improvement. Latrines are provided for the towns, though the number in some of them falls short of requirements. In all but two private scavengering is in force. The street sweepings and the contents of dust-bins and latrines are carted outside, and are buried, burnt, or otherwise disposed of. The sanitary progress of the year is very clearly summarized in the orders of the Madras Government on this Report, in which it is mentioned that the subject will be further dealt with in the Administration Report of the local bodies concerned. In accordance with the orders of the Government of India, a Sanitary Board had been constituted for the Madras Presidency, consisting for the present of the Sanitary Commissioner and the Sanitary Engineer, but its operations did not commence till April 1890, and do not therefore fall within the year under report.

41. *Sanitary Improvements effected in Bombay.*—As regards improvements, the Bombay Presidency has little to show for the year's work. In the 154 municipal towns contained in the tabular statement already referred to, the entries in the column "New Works" are few and unimportant, including only a few latrines, urinals, and surface drains. It would seem, however,

that this column ought to contain information which has been for some unexplained cause omitted, because opposite Ahmedabad there is the entry that there were no new works, whereas from the Sanitary Commissioner's remarks on this town we learn that the new water works and drainage scheme was in hand, but that so far progress had been slow. The Bombay Government directs that the remarks of the Sanitary Commissioner on the towns he inspected be brought to the notice of Collectors and Presidents of municipalties. No mention is made of any Sanitary Board for the Bombay Presidency.

42. *Sanitary Improvements effected in Bengal.*—Of large sanitary works done during the year Bengal can adduce none. In Appendix III. a statement is given which shows a large number of useful improvements carried out in the towns and districts of the province at the expense of public funds, and others which were met by private liberality. These include such operations as the making of new tanks and wells, the clearing out of old ones, the construction of urinals and latrines, the improvement of surface drains. The most important was the extension of the water-supply of Dacca at a cost of Rs. 17,000. It is gratifying to learn from the orders of the Local Government on this Report that during the early part of 1890 several municipalities had applied for loans in order to undertake important works of sanitary improvement, and that such applications will always receive the most favourable consideration. The Sanitary Board was formed after the year under report had closed, and consists of a member of the Board of Revenue as President, with the Chief Engineer of the province and the Sanitary Commissioner as members, a Sanitary Engineer being placed at the disposal of the Board. The Lieutenant-Governor remarks:—"The "functions of this officer will be to accompany the Sanitary Commissioner on his tours, to work "in concert and concurrence with him in the preparation of designs, plans, and estimates, to guide "the municipalities in getting up projects, and after these have been approved by the Board, and "under the advice of the Chief Engineer, to inspect the works while in course of construction, "and report to the Board on the progress made. It is intended that he should be the right-"hand man of the Sanitary Commissioner in all matters involving engineering knowledge and "experience. The Sanitary Board will be the executive agency through which the Government "will act in the Sanitary Department, and it is hoped that, if judiciously worked, it will exercise a "powerful initiative and a valuable control in all departments of sanitary work." We regard the step as of such great practical importance for the future progress of sanitary improvements in Bengal that we have extracted the passage in full.

43. *Sanitary Improvements effected in the North-West Provinces.*—The year's record shows a large number of minor sanitary improvements in the North-West Provinces, and very decided progress in great sanitary works. The minor improvements include such as are usual,—erection of latrines and slaughter-houses, laying down of new surface drains or remedying defects in old ones, the construction of wells, &c. The attempt to supply the city of Lucknow with water by means of an artesian well unfortunately failed after a large sum of money had been spent upon it. Works to supply a sufficiency of pure water to the three large and important cities, Benares, Allahabad, and Agra, were progressing favourably. The Benares scheme was not commenced till February 1890, but it was expected that filtered Ganges water would soon be supplied in every street and lane of this sacred city. At Allahabad, also the works were being pushed on actively. The water is to be pumped from the Jumna, cleared in settling tanks, filtered, and then distributed in the proportion of 15 gallons per head for the city and 20 gallons per head for the civil lines. The scheme is also intended to take in the military cantonments. The Agra works were well advanced, and, it was hoped, would be completed by the end of 1890. The water is to be pumped from the Jumna, passed through filter beds, and distributed through the town. The plan will admit of extension to the military cantonments and outlying hamlets. During the year a Sanitary Board was constituted for the province. It consists of the two Secretaries to the Government in the Public Works Department, the senior being President, the Secretary to the Government in charge of the Department of Municipalities and Local Boards, the Inspector General of Civil Hospitals, the Sanitary Commissioner, the Legal Remembrancer, and the Director of Land Records and Agriculture, who will also be Secretary to the Board. The Commissioner of each Division will also be *ex officio* a member, and two Native gentlemen are to be selected by him who are willing to be placed on the Board and whose services are likely to be useful. In order still further to have the benefit of the opinion of local officers at any particular meeting, the President may invite the District Magistrate, the Civil Surgeon, Military officers, and unofficial Europeans to be additional members. The Board had already held several meetings, but the results of their proceedings are reserved for the Annual Report of 1890. The outcome of this most important step in sanitary administration will be watched with much interest.

44. *Sanitary Improvements effected in the Punjab.*—The chapter of the Punjab Report which deals with sanitary work shows that a number of such larger works were in contemplation and under consideration. Of schemes actually in progress the most important were the water-works for the city of Delhi, remodelling and extending the drainage of the town of Karnal, extra-mural drainage of the city of Amritsar and of the towns of Gujranwalla and Jullundur, drainage for the town of Ludhiana, laying down a main for the supply of water to the hill station of Murree and the supply of water to the city of Peshawur, a work which was well advanced. The minor works, such as have been referred to in the other provinces, have not been enumerated by the Sanitary Commissioner, nor is any mention made of a provincial Sanitary Board, but we learn from the orders of the Government of India on the Report that such a Board has been established.

45. *Sanitary Improvements effected in the Central Provinces*—There is no statement of minor improvements in the Central Provinces, except as regards wells, of which many were repaired during

the year and many new ones built. The only major work of the year was the extension of the Nagpur water-supply. In his orders on the Report the Chief Commissioner gives valuable and important information. It appears that the Village Sanitation Act has enabled him to enforce some amount of sanitary reform in the larger and more flourishing villages, where the means of the inhabitants are sufficient to permit of funds being raised for this purpose, and that in smaller villages elementary reforms may be carried out in accordance with the rules issued under the Central Provinces Land Revenue Act. "But in working either set of rules," he observes, "it "is necessary to proceed with caution and judgment. It is not to be expected that the long-"established customs of the people will be speedily reversed in the interests of hygiene. It will "take many years of steady pressure and education before wholesome habits are grafted upon an "ignorant and conservative rural population." Full instructions have been issued to regulate the proceedings of the Sanitary Commissioner after inspections, so that his recommendations may be fully explained and discussed with all the authorities concerned, the district officers, the municipalities, Local Boards, and District Councils, and practical action taken upon them as far as possible. The Chief Commissioner remarks that the Sanitary Commissioner has already done much to improve the condition of not a few of the municipal towns, and that "he has ceased to be a mere recorder of inspection memoranda to which nobody paid any practical attention." The Sanitary Commissioner and Superintending Engineer are to form the Sanitary Board. "In time, every town in the province "will be surveyed on a large scale, careful levels will be taken, and definite schemes of water-supply, "drainage, and conservancy will be worked out." All this represents real progress towards practical sanitary work, which we are glad to be able to record.

46. *Sanitary Improvements effected in Burma.*—In the town of Rangoon, Rs. 13,19,938 were expended during the year on the new drainage and high pressure water-supply. These drainage works were opened in December 1889. No details have been given, but it is mentioned that they have been favourably reported on. At Mandalay a scheme of partial drainage was carried out at considerable cost by the military authorities. With these exceptions the sanitary work of the year was confined to minor improvements. A full detail of these, with particulars of cost, is given in Section IX. They consist chiefly in the construction of new wells, clearing and deepening old ones, small works of drainage, erection of latrines, building and improving markets. Dr. Sinclair says that "considerable attention has been paid to the removal of surface impurities, clearing of surface drains, and the protection of sources of water-supply from impurities." A Sanitary Board had been formed for the province, but its constitution is not stated.

47. *Sanitary Improvements effected in Assam.*—In Section IX. a full account is given of the minor improvements effected in Assam during the year, and of the money so expended, under various headings. Of these the two most important are drainage and water-supply, on which, combined, about Rs. 40,000 were spent during the year over the whole province. Although there is not much in the way of specific measures of improvement to be recorded, and nothing in the way of large works, it is gratifying to learn from the orders of the Chief Commissioner in this Report that "some real progress has been made during the year under report both in urban and rural circles." And, again, in another place, that "substantial progress has been effected during the year." The constitution of the Provincial Sanitary Board is not explained, but it had been appointed, and had entered on its important work.

48. *Sanitary Improvements effected in Coorg.*—No works of any importance were carried out in Coorg. A few new wells were constructed, a few old ones were repaired or deepened, and details are given of other minor improvements, some of which, however, such as "repairs to the municipal office" are somewhat out of place in a "statement of sanitary works." It would appear that a Sanitary Board was established in 1888. In 1890 it was strengthened by the addition of the District Magistrate to it.

49. *Sanitary Improvements effected in Hyderabad.*—As is unfortunately the case, more or less, in all the provinces sanitary improvements have been much impeded in the Hyderabad Assigned Districts by want of funds. Large schemes for drainage and water-supply are blocked for want of money. The available income has been expended chiefly on conservancy and minor improvements, the only exception apparently being the outlay of Rs. 30,000 during the year on the extension of the Amraoti city waterworks. We should like to have heard more fully about these works. It is mentioned (at page 29) that they have cost Rs. 3,02,646, but it does not appear whether they were completed or not. The statements regarding the water-supply of this place are indeed very confusing. In the Sanitary Estimate, at page 26, opposite the town of Amraoti it is said that the water is "sufficient and of good quality." In the extract above given from the Municipal Reports it is stated to be altogether insufficient. Then again in one place it is said that "no important sanitary works were undertaken during the year," whereas in another place, as already mentioned, Rs. 30,000 are entered as having been expended on an extension of the water-supply. In this province, instead of one general Sanitary Board, a system of district and village Boards has been adopted. Some proceedings of the Akola District Board are given in the Appendix. The sanitary survey of towns and villages, which was commenced in 1888 under the orders of the Government of India, had not made sufficient progress, as it was found difficult to arrange for the meeting of three officers having such multifarious duties to perform as the Sanitary Commissioner, the Examining Engineer, and the Deputy Commissioner. It was accordingly arranged that in future the first survey should be made by the Sanitary Commissioner, that the assistance of the Executive Engineer should next be called in, and that then their conjoint recommendations should be made over to the President of the District Board, in order that they might be carried out so far as funds would admit.

50. *Vaccination in the different Provinces.*—Among the measures which are being taken in India for the prevention of disease, the great work of vaccination specially directed against small-pox

naturally finds a place. On this subject separate reports have been received from all the provinces except Coorg, information regarding which is included in the General Sanitary Report. We do not propose to enter upon a detailed examination of the working of this branch of the Sanitary Department in the different parts of India. These details have been fully explained in the Reports themselves, and commented on in the orders of the Government. It will suffice to reproduce the main facts, and these may be most conveniently seen and compared for the different provinces in the annexed tabular form:—

Vaccination in 1889–90.

Province.	Number of Births registered in 1889.	Number of successful Primary Vaccinations.		Number of successful Re-vaccinations.	Per-centage of Success.		Number of successful Vaccinations and Re-vaccinations per 1,000 of Population.
		In Children under One Year.	At all Ages.		In Primary Vaccinations.	In Re-vaccinations.	
Madras - - -	867,523	171,822	798,944	13,615	95	76	26
Bombay - - -	600,489	390,910	547,787	24,204	94	61	34
Bengal - - -	—	270,718	1,671,501	5,289	99	32	28
North-west Provinces and Oudh	1,629,210	323,922	700,429	9,620	93	65	16
Punjab - - -	759,049	479,102	610,976	145,182	95	50	40
Central Provinces - -	346,515	196,354	338,961	36,450	96	82	34
Burma - - -	77,298	16,153	82,060	17,600	86	69	26
Assam - - - -	141,236	15,239	127,793	351	91	83	24
Coorg - - - -	2,917	768	8,094	97	93	84	45
Hyderabad - - -	108,780	70,072	85,209	1,705	95	26	35

These figures include only the operations of the special vaccination departments. In some parts, as in the North-West Provinces, no other agency is employed, but in others this special department's work is supplemented by the dispensaries, which exist always at the headquarters, and more or less in outlying parts of each district in the country. These dispensary cases in 1889–90 varied from about 3,000 in Burma and the Punjab to nearly 24,000 in Madras, and nearly 100,000 in Bengal. We have in the statement placed the vaccinations performed in children under one year side by side with the recorded births of the year 1889, so that it may be seen how far the protection has been extended to the additions made to the population during the year. Due allowance must be made for the fact that many infants die who have never been vaccinated, and that thus the material which most urgently needs protection is reduced. On the other hand, it is to be borne in mind that in many of the provinces the births registered, according to the most trustworthy estimate, fall considerably short of the truth. Having due regard to both these considerations, it is evident that in all the provinces only a portion, and in most of them only a small portion, of the children born during the year are protected. The Local Governments and the Government of India all insist on the necessity of continuous and careful inspection to check the returns of the vaccinators, and the Sanitary Commissioners themselves are alive to the fact that without such inspection little reliance can be placed on these returns. The inspections, in fact, supply local standards by means of which it is essential to test the general results over the province. The divergencies shown in the statement are striking. No doubt some of them, such as the number of cases per population, are to be explained by the difference of the strength employed in different parts, but others are not affected by this cause, such as the percentage of success, both in primary vaccinations and re-vaccinations. This last varies from 82 in the Central Provinces and 83 in Assam to 32 in Bengal and 26 in Hyderabad. As a rule, the percentages of success in re-vaccination are high, and seem to show either that the returns are incorrect, or that the primary operations had been inefficiently performed. The great test which we desire to see of the benefit derived from vaccination successfully carried out is undoubted evidence of a marked diminution in the mortality from small-pox, but here precise data are wanting. It is only by taking the statistics over a series of years that any sound conclusion on this point can be drawn. Vaccination has now been carried on in most parts of India for a long period, and it certainly is disappointing that no more striking facts are forthcoming, such as can be adduced in England and other European countries, to prove that it has had a most decided and undoubted effect in diminishing small-pox. It is very desirable that the point should be fully discussed in all vaccination reports, for it lies at the root of the whole question, and until it can be shown that vaccination has really reduced the prevalence of small-pox, it would appear that there must be defects in the working of the department which need to be remedied. In a statement given by the Sanitary Commissioner for Bengal, in paragraph 17 of his Report, the mortality from small-pox in areas under vaccination is compared during a series of years with that in areas not under vaccination. In most of the years the comparison is in favour of the areas under vaccination, but in 1888–89 there was no difference between the two, and in 1889–90 the difference was only fractional.

51. *Conclusion.*—In conclusion, we would remark that the practical sanitary lessons to be learnt from the experience of another year are the same as we have so frequently drawn attention to in former years.

But the principal points to which we should especially desire to draw attention are the following :—

1 The registration is still very imperfect, and, with a view to its improvement, it is suggested—
   (*a.*) That in order to test the registration returns more use should be made of the vaccination staff.
   (*b.*) The Sanitary Commissioners should show in their annual reports not only the district averages, but the registration circle ratios of which those averages are composed.
   (*c.*) The report of the Sanitary Commissioner should succinctly state the principal fact as to the meteorology and the price of food during the year, in comparison with the vital statistics.

2. In regard to diseases—
   (*a.*) Cholera is a disease which is singularly localized, and can best be prevented by the removal of local sanitary defects. Railways appear to exercise no influence on the distribution of cholera either in time or place.
   The study of cholera would be facilitated by the adoption by all the Sanitary Commissioners of one form of map on which the requisite information should be given on a uniform principle.
   (*b.*) Fever is similarly due to the local conditions, including the water-logging of the soil, and its increase or diminution is therefore largely in the hands of the Sanitary Engineer.

3. Insanitary conditions are pretty evenly distributed over the whole of India; but it is satisfactory to see that the Minute of Lord Dufferin is beginning to bear fruit, which urged the several Provincial Governments to appoint Executive Sanitary Boards to watch over the sanitation of the several provinces.
   These Boards were to consist of an officer from the Revenue Department in addition to the Sanitary Commissioner and a Sanitary Engineer, and by their means the great sanitary problems which are involved in extensive irrigation works would be more effectually controlled.

We are glad to note that since Indian Sanitary Reports were last received by the Army Sanitary Commission, three years ago, a decided advance has been made in this most important work, and that though the difficulties are very great, and need to be dealt with patiently and continuously, there is evidence of real progress.

20th August 1891.

No. 3.

MEMORANDUM by the ARMY SANITARY COMMISSION on the ADMINISTRATION REPORTS of the COMMISSIONERS of the TOWNS of CALCUTTA, MADRAS, and BOMBAY for 1889–90.

We shall discuss these three Reports in one Memorandum, as the facts can in this way be compared with interest and advantage. The last of these Municipal Reports which we commented on were the Calcutta and Bombay Reports for 1885–86, and the Madras Report for 1884–85. In our remarks we shall adopt the same general principles which we have followed in dealing with the Provincial Sanitary Reports for 1889. We shall first consider the state of the public health in the three Presidency towns as indicated by the vital statistics and the history of the chief diseases; secondly, the sanitary defects or local disease causes brought to notice; and thirdly, the practical measures taken during the year to remedy these defects.

2. *Vital Statistics.*—These statistics are for the calendar year 1890, and nearly all of them are based on the Census of 1881. In some few instances, however, the Bombay ratios are calculated on an estimated increase of the population, thereby introducing an element which disturbs the comparison, especially as the amount of the estimated increment is not mentioned. Calcutta and Bombay both furnish distinct Reports by the Health Officer of the town. Madras furnishes no separate Report by the Health Officer, but gives all that is to be said regarding the public health and every other branch of municipal administration in one general Report by the President of the Municipality. For part of the year there was no Health Officer in Madras, the Sanitary Inspector was in charge of the Health Department.

3. *Births.*—In Calcutta the births of the year equalled 20·2 per 1,000, the highest ratio in 11 years, the mean of the preceding 10 being 17·9. The rate varies greatly in different classes, from 14·9 among "non-Asiatics" to 43·3 among "mixed races." These and the other figures to be cited regarding Calcutta refer to the town proper, and not to the amalgamated portion of the suburbs, as great changes have taken place in this part since the last census, and the population is very uncertain. Even within the town the population is so migratory that there is no fixed basis on which to calculate either the births or deaths. It is estimated that two-thirds of the people are merely temporary residents, and many when they fall sick return to their homes and die there. In Madras the birth-rate equalled 40·9, the equivalent of 16,349 births. This is the highest number recorded except in 1882, when it reached 16,523. During the previous 10 years it was persistently high, and averaged 15,957. It is remarkable that during 1890, of the total of 16,349 births, 2,053 occurred in the hospitals. The high birth-rate of Madras, it is remarked, cannot be due to erroneous registrations, as every birth registered is verified afterwards under the vaccination byelaws.

From the vaccination returns it appears that the number of children under one year successfully operated on in 1889–90 largely exceeded the birth registered during the year. The explanation given of this remarkable result is that all the infants operated on were not born in Madras. Some mothers come from the country for their confinement; on the other hand, it is said that others go up country for that purpose and return to Madras. The births in Bombay equalled 20·03 per 1,000, This represents 15,493 births, a number considerably under the total of 1888, when it was 16,760. but varies little from that of 1887, when it stood at 15,429. The rate varied greatly in different divisions of the town. Omitting the Water Division where the circumstances indicated by only two births in a population of 24,887, or a ratio of ·08, must be very exceptional, and also the southern portion of the fort, where it equalled only 1·42, the ratios range between 8·82 at Worli and 45·31 at Parel. In all three towns the male births exceeded the female births, as may be seen in the following table, in which the birth-rates in them are compared:—

	Births.	
	Per 1,000 of Population.	Proportion of Males born to every 100 Females.
Calcutta - - - -	20·02	110
Madras - - - - -	40·9	107
Bombay - - - -	20·03	108

4. *Deaths in Calcutta.*—The deaths in Calcutta equalled 26·9 per 1,000, somewhat under 27·7, the ratio for 1888. Since 1864 the rate has varied between 54 in 1865 and 23 in 1871. In all these years the losses by death have largely exceeded the additions by births, a fact which illustrates the peculiar position of the population and the exceptional character of its vital statistics. In 1889 the excess of deaths over births amounted to 6·7 per 1,000. In many quarters of the town it was much greater than this. In the Burra bazaar, where the difference was most marked, the deaths were four times more numerous than the births. Of the total mortality of the town, fevers account for 7·7, bowel complaints for 3·0, cholera for 2·4, and the large proportion of 13·0 appears under the head of other causes. Among Hindoos the death-rate equalled 28·4, and among Mahomedans 25. In Table No. VIII., appended to the Health Officer's Report, the mortality according to locality is shown, a most important statement from a sanitary point of view. Hastings heads the list with a death-rate of 36·3. Six other divisions record a rate of over 30 per 1,000. In the column of "Remarks" some information is given as to the number of bustees in each division, and an important item is added in another column, the proportion of children under 10 years of age per 1,000 of inhabitants in each of these divisions. In comparing the death-rates of particular localities this is a most important element which is apt to be left out of consideration. It is all the more important when the death-rate among children is so high as 313 per 1,000, the rate for Calcutta during 1889. The practical question is, what is the sanitary condition of these localities, in what respects do they differ from one another, what are the local disease causes, and how can these be remedied? All statistical inquiries are more or less open to fallacies, and in Calcutta, owing to the shifting nature of a great part of the population, they are more than ordinarily difficult. It is to be hoped that some at least of these difficulties will be cleared away by the Census of 1891.

5. *Deaths in Madras.*—In Madras the mortality equalled 42:8. This mortality, which exceeded that of 1888 by 4 per 1,000, is ascribed chiefly to an epidemic of measles, from which 1,204 deaths were registered against 49 in the year previous. To the same cause also is no doubt due in part the excessive death-rate among infants under one year. In 1889 this rate equalled 583 per 1,000, but in 1888 also it was enormous, amounting to 540. The deaths among children are not localized, and until this is done, the first step is wanting towards discovering the cause. The mortality among children in Madras is persistently high, and calls for careful inquiry, not only in itself but also in its bearing on the general mortality of the town. Such an excessive death-rate as 583 per 1,000 among children under one year must largely affect the death-rate of the town as a whole. It is important, therefore, to know what is the number of children in Madras, how this compares with the number in Calcutta and Bombay, and how the ratios would stand if they be taken separately for children and adults. As we have already seen the birth-rate in Madras is about double what it is in Calcutta or Bombay, and it is therefore reasonable to suppose that the proportion of children in Madras is much larger than in the other two Presidency towns. This would go far to explain the great difference in the death-rates. But there still remains the question, why are the death-rates among children in Calcutta, and also as we shall presently see in Bombay, so high, and why is this death-rate among children in Madras so much the highest of all? Contrary to the experience of Calcutta, the mortality among Mahomedans was higher than among Hindoos. In the different quarters of Madras the death-rate varied considerably, from 49·6 in the fourth division to 36·2 in the sixth. More information is desirable regarding the diseases which proved fatal in each, and also their respective conditions in regard to drainage, water-supply, cleanliness, and other sanitary requisites.

6. *Deaths in Bombay.*—In Bombay, during 1889, the deaths of 23,378 persons were registered during the year. Of these about one half were persons who had been born elsewhere. The death-

rate equalled 25·71. The principal diseases which contributed to this result were fevers, respiratory diseases, phthisis, and diseases of the nervous system. Among Mahomedans the death-rate was very much higher than among Hindoos, being 35 against 24. Among children under one year it amounted to 291 per 1,000. It would appear, however, that in Bombay only the high castes are included in the term Hindoos. Without some definite agreement as to the classification of the population there can be no proper comparison of the results among races in different places. The mortality according to locality is shown in a table at page 320 of the Bombay Report, but the diseases to which it was due are not shown here, nor is anything said of the relation of the condition of each in respect of drainage, &c., or of any other circumstances by means of which the differing results are to be explained. In the Water Division the mortality equalled only 3·05, the next lowest is 9·67 in the southern part of the fort, and from this there are many gradations up to a maximum of 55·76 in Parel.

7. *Composition of the Death-rates in the three Presidency Towns.*—The composition of the death-rates in the three Presidency towns is shown in the following statement:—

	Ratio of Deaths per 1,000 of Population from							Deaths of Children under 1 Year per 1,000 of Population.
	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	All other Causes.	Total.	
Calcutta - - -	2·4	·16	7·7	3·0	·52	13·0	26·9	313
Madras - - - -	·4	·1	13·4	7·4	·3	21·0	42·8	583
Bombay - - -	·5	·33	8·69	1·89	·42	13·87	25·71	291

8. *A simple and uniform Method of showing the Vital Statistics much required.*—Before leaving the subject of the public health as illustrated by the vital statistics of these towns, we would observe that it would be of great advantage if the statistics were tabulated on one uniform and simple method in all of them. At present the tabular statements are very numerous and cover many pages. In the Calcutta Report there are 46 such statements, in the Madras Report 32, and in the Bombay Report 51, but they are all devised on different systems, and the consequence is that it is almost impossible to know where to look for any information desired, and frequently, after patient search, it is not to be found at all. We have no wish to curtail or do away with any tabular statistics which the municipalities may wish to retain for their own use, and no doubt the facts recorded in the tables now employed will in time afford valuable data to be collated and discussed in future years, but we would suggest that the figures for practical sanitary purposes year by year should be given in a very simple and concise way, so that the facts may not only be easily got at, but also that they may be, as far as possible, easily comparable in the three towns, for such comparison would prove of great assistance in arriving at correct conclusions. These statistics, moreover, should, if we may so express it, be self-contained; they should not require to be supplemented by reference to the census or other reports. We would also repeat what we have already urged elsewhere, that the use of "averages" as a basis of testing the results of the year should be abandoned. Averages are altogether misleading in the case of statistics of diseases in India. A very good illustration of this is given in the Madras Municipal Report. We are told there, with reference to the history of cholera during 1889, that the annual mortality from this cause in Madras during the previous ten years had averaged 324. Would anyone suppose from this that during those ten years the number of these deaths had varied between 2 in one year and 4 in another to 1,193 in a third? Averages are useful where the fluctuations between different years are slight, but in regard to most diseases in India, and especially to epidemic disease, they altogether misrepresent the facts. The tabular statements we would suggest are as follows:—

No. I. should show *for each division of the town, and for the town as a whole*—

The total population according to census of,—
- Number of males.
- Number of females.
- Number of persons under one year.
- Number of persons of one and under five years.
- Number of births (born alive) during the year.
- Births, male and female, and total per 1,000 of total population.
- Number of male to every 100 female births.
- Number still-born.

No. II. should show *for each division of the town, and for the town as a whole,* the number and ratio per 1,000 of population of deaths under each head of population contained in No. I.

No. III. should show *for each division of the town, and for the town as a whole,* the number of deaths and death-rate per 1,000 from cholera, small-pox, fevers, &c. (the same general divisions of diseases as are given in the Provincial Sanitary Reports).

The ratios ought in every instance to be calculated on the figures of the last census, and not on an estimated increment of population for which the requisite materials do not exist.

With these data we could see clearly how far the general results are affected by the mortality among infants and children, and how far any excess of mortality is localized in particular quarters of the town.

Comparison of death-rates by months, or quarters, or races is doubtless of interest, but for practical sanitary work by far the most important comparison is between the mortality and the locality in which it takes place.

9. *History of the Chief Diseases. Cholera.*—Turning now to the history of the chief diseases during the year, we find that cholera in Calcutta was less prevalent than usual. It caused 1,097 deaths. Since 1865 only two years, 1871 and 1880, show a smaller number. In 1871 they were 796, and in 1880, 805. There was a marked diminution during 1890 in the wards which benefited most from the increased water-supply. The sketch map at the commencement of the Health Officer's Report shows that the cholera deaths were widely distributed. In six of the eighteen sections the deaths under this head equalled or exceeded 3 per 1,000. In the Jorobagan section it reached the maximum of 4·3. For the town as a whole it was 2·4. Madras suffered from cholera less than usual; the deaths numbered only 182. In two of the quarters which suffered most the disease was believed to have been imported, and its arrest is attributed to isolation of the sick, disinfection, and burning in some cases of the huts in which the sick had been living. We observe from the tabular statement at page 202 that deaths from cholera were reported from 24 different localities in the town, and that in many of them the number did not exceed one or two, and yet in these instances apparently no isolation or disinfection was had recourse to. Of the 462 deaths from cholera recorded in Bombay during 1889, 397 were in persons born elsewhere, or, if the period of residence be taken, 170 had been in the place less than six months. Many of the victims were, no doubt, found among the destitute poor, who, as we shall presently see, flocked into Bombay from the northern parts of the Presidency. The total number of deaths was 83 in excess of the number in 1888. Of the 34 quarters of the town, only two escaped altogether.

10. *Small-pox.*—The mortality from small-pox in Calcutta during 1889 equalled ·16 per 1,000, the equivalent of 71 deaths. The number in 1888 was only 12, and in 1887 only 2. Jorobagan in 1889 shows the highest death-rate, ·46 per 1,000. As already seen, it had also the highest death-rate from cholera. A table at page 66 of the Health Officer's Report gives interesting statistics of the small-pox mortality in Calcutta for 58 years, and shows the extraordinary variations which have occurred even within recent times. During the first 16 of these years the number ranged from a minimum of 16 to a maximum of 2,840; in the next 16 the minimum was 19 and the maximum 4,430; in the third 16 the minimum was 18 and the maximum 4,923; during the last 10 years a minimum of 2 was reached in 1887, and the maximum 478 in 1884. In paragraph 186 of the Madras Report it is said that 66 deaths from small-pox were registered in Madras during 1889, but from the statistics it appears that the correct number is 45. In 1887 it was 36. The same remarkable fluctuations in the small-pox mortality are to be seen in Madras as have already been seen in Calcutta. In 1886 only one death from small-pox was registered in Madras, in 1884 the number was 4,064. The mortality due to small-pox in Bombay was ·33 per 1,000. Among Native Christians it equalled ·91 a result attributed to the influx of unvaccinated Native Christians from Goa. Of the total of 304 deaths, 116 were in infants under one year.

11. *Fevers.*—As may be seen from the tabular statements given in paragraph 7, the proportion of mortality due to fevers is very large, but there is great uncertainty as to the exact diseases classed under this head. As the Health Officer of Calcutta observes, this defect will be gradually remedied as more educated men get into practice. In the Madras Report it is said the mortality under fevers equalled 10·4, and that this excessive ratio was due in large measure to measles, but the total, including measles, amounted to 13·4. In Bombay also measles was prevalent, but the mortality only equalled ·70 per 1,000. The deaths registered from fevers numbered 7,266, of which 5,577 are entered as remittent, 405 intermittent, 1,259 simple continued, and 25 enteric.

12. *Enormous Mortality among Children.*—From the above we learn the great facts that the mortality in Madras was very high; that in all the three towns the infant mortality was appallingly high, more especially in Madras, where it equalled the almost incredible ratio of 583 per 1,000; that the mortality in Calcutta must be much greater in reality than what it appears to be from the recorded deaths; and that, though the Bombay statistics were unfavourably disturbed during 1889 by the influx of many distressed people, on the other hand here, as in Calcutta, there is a frequent increment of population which tends to the death-rate being understated.

13. *Defects in Sanitary Condition of Calcutta.*—What are the causes of these unfavourable results? In these Reports this question is not dealt with so fully and systematically as is desirable, but still mention is made, especially in the Calcutta and Bombay Reports, of very serious defects which exist in these towns, and to these we shall now refer. The Health Officer of Calcutta draws attention to the necessity for a better distribution of water to the large population living in huts and bustees. He cites the instance of Kristobagan, a bustee which has two tanks but no stand-posts. A photograph of one of these tanks when emptied shows that foul drainage must pour directly into it from the huts, and that the water must in consequence be horribly polluted; but the tanks are so conveniently near that the people will draw their water-supply from them, and that even though at the same moment and within a few yards of them others may be washing all manner of articles which render the water unfit for drinking. The only remedy, he says, is to supply plenty of stand-posts in convenient localities so that the people may find it is less troublesome to draw their water from them than from the tank. Even when owing to an outbreak of cholera in Kristobagan police were stationed to prevent the inhabitants from drawing water from the tanks, they would fill their vessels there whenever they

had the opportunity of doing so unobserved. We are glad to see that Dr. Simpson's representations on this very important matter had engaged the serious attention of the Commissioners. Another and very grave defect concerns the drainage. The Health Officer quotes the opinion of Dr. Joubert to the effect that the underground sewers in Calcutta have introduced a new element of danger into Native houses, that "the smell of sewer gas is to be found in most of them," and that "foul stinking drains in the lower parts of Native houses are the rule." Dr. Simpson states "that this opinion is endorsed by the principal and most experienced medical men in Calcutta," and adds that the problem of ventilating the sewers without injury to the public heath is difficult enough in the airy parts of the town, but becomes almost impossible in the crowded parts of Calcutta. This is an evil which is not now brought to notice for the first time, and it is one which demands most serious attention. Such a state of things as is above described involves great danger, and is inconsistent with the general remark in the Report of the Commissioners that "in the drainage Department sewers and drains were kept in efficient order" (page 4). In a matter of so much importance, and indeed in the case of every grave defect such as this which comes under the notice of the Health Officer, we would suggest that it be referred for report to the Engineer, and the result recorded in the Health Officer's Annual Report as embodying an important proceeding of the year. We should add that the Engineer in his Report writes: "The ventilation of the sewers has been carefully considered and is being carried into effect in all situations where it can be open to no doubt."

14. Dr. Simpson has much to say on the overcrowding of buildings, and regards this as the great sanitary defect which has now to be dealt with in Calcutta. The overcrowding, he points out, is not only a great evil in itself because it prevents the proper movement of air, but is also a great obstacle to the introduction of effective drainage. The filling of tanks, which has now been going on for some years, and is a decided improvement in other ways, has increased this particular evil, because it has supplied fresh ground for building, and so closed up open spaces which the tanks, so long as they existed, secured. The overcrowding is not confined to the poor parts of the town. The rich quarters are as much overbuilt; indeed, it would appear that the evil is more marked in the rich quarters, for their houses, being much more substantially built, rise in several storeys, and so shut out the air much more effectually than the low huts of the poor. Dr. Simpson gives a diagram and photograph to illustrate the condition of things in one small district called Jorasanko, and no doubt the buildings there are greatly overcrowded. The existing law, he says, is powerless to cope with the evil, even as respects new buildings. The question is a very large one, and beset with difficulties. The Commissioner observes that much is being done to improve the aeration of the crowded localities by opening up new roads, setting back the house line in old streets, and filling up putrid tanks. Whatever other measures may hereafter be found advisable in order to secure a freer movement of air, we would urge that all available funds should, in the first instance be devoted to the thorough perfecting of the drainage and water-supply.

15. *Sanitary Defects in Madras.*—In Madras leaks having been discovered in Sewer No. 2, a thorough examination was made to ascertain their exact situation and extent. It will be necessary to relay the sewer in certain places, but it was a question whether this should be done by rebuilding in masonry or by using iron pipes. A Committee appointed by the Government to report on the matter recommended that certain lengths of this sewer aggregating 275 feet should be rebuilt, and the leaks in other parts specially dealt with according to their several conditions. The quality of the water-supply had deteriorated. Of four samples analyzed three were pronounced bad and one suspicious. This deterioration is attributed to drainage from neighbouring villages into the Red Hills tank, and steps were being taken for their removal. The latrines in Madras are, with few exceptions, mere open walled inclosures, affording no privacy or protection against sun or rain, and without masonry, flooring, or trenches. Dry earth, it is said, cannot be used in them for any good purpose, especially during the rainy season. The number of these latrines, is also insufficient, and it is proposed that every year a few new latrines on a standard plan should be erected as funds will admit, proper accommodation being furnished in them for storage of dry earth. In a large city like Madras, such a system must entail a very large and never-ending expense on establishment required for the removal of the night-soil, but until a proper drainage scheme has been carried out there seems no remedy for this.

16. *Sanitary Defects in Bombay.*—The immigration of many destitute persons from Kathiawar and Guzerat increased the difficulties of sanitary administration in Bombay during 1889. Among other evils which appeared to be connected with this influx was an increase in the number of lepers. The Health Officer is of opinion that this increase is very serious, that the lepers must have more than doubled since the Census of 1881, when they amounted to 430, and that in 1889 they probably were above 1,000. He urges the removal of the lepers from the city and their segregation elsewhere, and cites two instances in which he believes that the disease was communicated by contagion. The actual figures of leprosy in Bombay at the Census of 1891 may be awaited. We will only now remark that even if the cases cited be considered evidence of contagion, it is not in accordance with experience to believe that any such increase of leprosy as he supposes had taken place can have been due to this cause. We are glad to see that the Commissioners do not appear to be favourable to the proposal that the lepers should be forcibly removed and segregated, because we doubt whether the community at large would be benefited, though the measure would certainly involve much expense, and an interference with liberty which must frequently involve great injustice. On the same grounds we would strongly deprecate their carrying into effect the idea of guarding the approaches to the city "so "that persons found to be suffering from a dangerous or infectious disease or leprosy may be "intercepted and taken to a dharmsala or to a leper aslyum for treatment or disposal." Such a

system would inevitably cause much oppression, it would cause great evils, and there is no evidence that it would do any good. Even if it were based on correct theories, which we do not admit, it must certainly fail in practice.

17. During the monsoon a serious nuisance arose from the reservoir on the flats, which is described as then becoming a pond of sewage, smelling most offensively, even at a considerable distance. This evil can only be fully remedied when the sewerage of the city is completed. The following remarks of the Health Officer on new buildings deserve attention:—"I inspected the houses, and some of "them were of the worst type of building, without open space on either side, and therefore with "room space which could not have direct light from without, and could not be wholesomely ven-"tilated. This is the type of building which had to be permitted under the old law, and which "cannot be prevented in the case of houses built on old foundations as in the cases under the new "law." With reference to the great mortality among low caste Hindoos, he says: "The mortality of "Hindoos, low or out-caste, has increased. The out-caste population is increasing rapidly, and it is a "population living under unfavourable conditions crowded into the most crowded chawls, more than "one family in one room. . . . It is difficult to improve their condition. If they go into good "houses or large rooms they divide them, place partitions, and make them unwholesome. Their "poverty and absence of caste training make them helpless." With regard to Parel and Byculla, where the highest death-rates of the year occurred, he says: "A portion of Byculla has a system of "drainage, but Parel has not. There are in both sections serious nuisances from houses without "drainage, and where there is no drainage, and around houses which have not been connected with "drains, sewage pollutions amidst dwellings and around dwellings and around the district, sewage in "parts, where there are dwellings, soaking into the ground, polluting ground and buildings, and "oozing from increasing foulness to the ditches by the railway lines." He describes second Nagpada section as "in a very insanitary condition. The mortality for some years has been very high, and I "ascribe it to the intense house crowding, imperfect house ventilation, and imperfect drainage." Speaking of cholera, he remarks, that as the population increases and the water-supply becomes thus relatively smaller more well water is being drunk, and adds, "the conditions generally surrounding "cases of cholera arise from imperfect ventilation and imperfect drainage. The house crowding in "the city is very great, and the contamination from it terrible." Other passages of a like tenor might be cited, all graphically describing the great evils existing in the town. The first step towards grappling with them is to realize their presence, and the Health Officer is, we are glad to see, fully alive to them.

18. *Sanitary Work done in Calcutta.*—We shall now note the more important sanitary work during the year in the three Presidency towns. In Calcutta the new pumping station in Halliday Street had been brought into operation, and the supply of water in certain wards thereby increased. An additional 38 miles of pipes laid during the year raised the total to 184 miles, and through these the daily average consumption of filtered water was 16,737,950 gallons, compared with 3,011,969 when the work first came into use in 1870. Under the head of drainage also much was done, many flushing chambers and manholes were added, kerb stones and channels were provided for the sides of streets, in some poorer parts of the town, 685 more premises were connected with the sewers, raising the total of such connexion to 25,938. In the amalgamated area also the work of improvement had made a good beginning, and several of the wards had already been supplied with filtered water. The filling up of tanks continued; 21 were taken in hand during the year. Of these, 8 were filled up, and 13 were in progress of being filled up. A higher degree of general cleanliness was also attained, as evidenced by the fact that the amount of refuse received in the salt water lakes, 20,549 waggon loads, represents an increase of about one third on the total of 1888. The privies separately served numbered 33,799, an increase of nearly 1,000 on the year previous.

19. *Sanitary Work done in Madras.*—During the year Madras expended Rs. 79,575 on the drainage of Blacktown, raising the total expenditure on this work to Rs. 9,97,879. Of house drains 630 were added and repaired, making a total of 8,205 such alterations since the drainage works began. The rebuilding part of Sewer No. 2, and stopping leaks in other parts, were commenced in March 1890. Under the head of waterworks, 1,400 yards of pipes were laid, and 16 fountains added. The total number of fountains at the end of the year stood at 733. The quantity of water supplied averaged 18 gallons per head daily.

20. *Sanitary Work done in Bombay.*—A failure in the pumping engines at Love Grove necessitated their being put in thorough repair, and this resulted in a more effective disposal of the sewage. Owing to complaints of the sewers in the marine lines, and a difference of opinion as to the proper course to pursue in regard to them, it was resolved to invite Mr. Baldwin Latham to visit Bombay and give authoritative advice on the whole of the drainage and sewerage of the town. This he did, but the results fall to be chronicled in the year following. Pending a decision on this most important matter schemes of drainage and sewerage for Parel and other parts were held in abeyance. A deficiency of water led to the adoption of the Pawai works. These which were far advanced, and were to be completed in June 1890, comprise two masonry dams, one across the Pawai nullah, and the other across the Goper river, about one mile below the Vehar lake, the water so obtained being discharged into the Vehar mains. They add eight millions of gallons to the daily supply. The Tansa scheme, the works to stop leakage at Vehar and Tulsi and in the Malabar Hill reservoir, all designed to increase and improve the water-supply of Bombay, had made good progress. Eight hundred new connexions had been made during the year, showing a steady increase in the demand for water. In the Buildings Department also a large amount of work had been done. Of 1,378 applications to

build or rebuild houses, 1,291 were passed; 5,492 notices regarding buildings were served on owners, and 2,232 orders were issued for the summary removal of ruinous houses, huts, or objectionable constructions. As a striking example of the benefit to be derived from sanitary improvement may be cited the village of Matoonga, where out of 297 inhabitants, 89 were found to be suffering from guinea worm. Pipe-water was supplied, and guinea worm disappeared.

21. *Vaccination in the three Presidency Towns.*—In conclusion, we may note the progress of vaccination. In Calcutta there were 11,053 primary successful vaccinations, and 615 successful re-vaccinations, the ratios of success being 88·12 and 18·09. Calf lymph was largely used. The Vaccination Act was in force, and 674 prosecutions instituted under it. These figures embrace the amalgamated area as well as the town. Madras returns 23,504 persons as having been successfully operated on during the year. The percentage of success recorded was 97·01 in primary and 81·48 in re-vaccinations,—a suspiciously high figure. Calf lymph was employed largely, and Rs. 375 realised by sale of lymph. As already mentioned, we have the remarkable fact that the number of infants under one year who were vaccinated exceeded the births of the year. Of 20,337 persons primarily vaccinated in Bombay, 15,355 were under one year of age, and of these only 4,852 were successful. 4,498 were re-vaccinated, and of these 1,408 successfully.

22. The chief recommendations we have made may be thus summarised:—

1st. That the annual vital statistics of the three presidency towns should, for sanitary purposes, be prepared on the simple plan suggested in paragraph 8, so that mortality may be shown more clearly according to localities, and the proportion of this mortality among infants in each be indicated.

2nd. That the reports should deal more fully with excessive mortality in any locality in conjunction with the special disease causes existing in that locality.

3rd. That special inquiry should be made as to the causes of the enormous mortality among infants, especially in Madras.

4th. That the water-supply, which has been so much improved in Calcutta and Bombay, but which is still very defective in Madras, should be rendered in all of them as complete as possible, care being taken that stand posts are provided in such sufficiency that the people may find them more convenient than any other source of supply which may still exist.

5th. That when any grave defects are brought to notice, such as the smell of sewer gas complained of in Calcutta, it should be clearly stated what action was taken on the report of the Health Officer.

6th. That, except on the clearest evidence of their necessity and of the certainty of their doing good, no measures should be adopted, such as those suggested in connexion with leprosy in Bombay, which are liable to grave abuse, and may easily become means of extortion and oppression.

20th August 1891.

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REPORT.

I.—EUROPEAN ARMY.

The present Report on Sanitary Measures in India during the year 1890 is prepared for presentation to Parliament. It contains chapters on the health of the European and Native Troops, on the health of prisoners in jails, and on the health of the general population; it also contains chapters on vaccination, on medical institutions, including medical schools and lunatic asylums, and a chapter on sanitary works. Appended to the Report are abstracts of reports by the three principal Sanitary Commissioners in India, and memoranda by the Army Sanitary Commission in England reviewing the several Sanitary Reports for India.

Sickness and mortality in 1890.

There was more sickness among the European troops on service in India during 1890 than in the previous year, but the mortality was less. Of an average strength of 67,823, the admissions into hospital were in the ratio of 1,520 per 1,000 against 1,498 in 1889, the daily sick-rate was 87 or 1 per 1,000 more, and the death-rate 13·84 against 16·60. The loss by invaliding was 25 per 1,000, or 1 per 1,000 less than in 1889, bringing the total loss by death and invaliding up to 39 per 1,000, a decrease of 4 per 1,000 on the previous year.

The following statement shows the relative extent of sickness and mortality among European troops in the three Presidencies during 1890 and the previous year:—

Presidency.		Average Strength.	Ratio per 1,000 of Average Strength.				
			Admissions.	Daily Sick.	Deaths.	Invaliding.	Total loss.
Bengal	1890	41,353	1,584	89	15·50	25	41
	1889	42,821	1,517	87	16·07	24	40
Madras	1890	13,707	1,442	91	12·84	23	36
	1889	13,619	1,507	90	20·05	30	50
Bombay	1890	12,763	1,396	77	9·56	29	38
	1889	12,826	1,425	78	14·74	27	42
India	1890	67,823	1,520	87	13·84	25	39
	1889	69,266	1,498	86	16·60	26	43

It will be seen from the above statement that of the three armies Bengal was the most unhealthy in 1890. The chief causes of sickness in the whole European Army were, as in the previous year, venereal diseases and ague, the former yielding a ratio of 504 per 1,000 against 482 in 1889, and the latter 354 per 1,000 against 334. More than half (56 per cent.) of the total sickness resulted from these two causes. Influenza was present among the troops, and caused an admission rate of 33 per 1,000. Enteric fever, as usual, was the chief death cause, but it was less fatal than in the previous year, the death-rate having fallen from 6·11 to 4·91 per 1,000. Cholera also was much less prevalent, there being only 58 admissions in 1890 against 103 in 1889, and 49 deaths, equal to 0·72 per 1,000 against 78 or 1·13.

Bengal Army.

In the Bengal Army the admission-rate rose from 1,517 per 1,000 in 1889 to 1,584, the daily sick-rate increased from 87 to 89 per 1,000, but the death-rate fell from 16·07 to 15·50. Venereal diseases and ague were the chief causes of admission to hospital, contributing 32 and 25 per cent. respectively of the total sickness. The chief cause of mortality was enteric fever, with a ratio of 6·26 per 1,000 against 6·68 in 1889. Under this one head alone 40 per cent. of the total deaths occurred. Cholera was more fatal among the Bengal troops than in 1889, the deaths having increased from 36, or 0·84 per 1,000, to 41, or 0·99.

Of the seven geographical groups into which the European Army of Bengal is divided, five returned a higher admission-rate than the average rate of the Presidency, viz., Bengal Proper group 1,985 per 1,000, Agra and Central India group 1,972, Meerut and Rohilkund 1,753, the Punjab 1,651, and the Gangetic Provinces and Oudh 1,620. Of the other two groups, Quetta district recorded an admission-rate of 1,099 per 1,000,

and the Hill Stations 1,217. All but two of the groups—Punjab and Quetta district—recorded admission-rates in excess of those of 1889. The average death-rate of the Presidency was exceeded in three groups, and three returned higher ratios of mortality than in 1889. The increase was most marked in the Hill Stations, the death-rate of which rose from 9·76 to 13·46. Meerut and Rohilkund followed with 22·50, which was the highest death-rate of all the groups, against 18·73, and the Gangetic Provinces and Oudh with 17·59 against 17·32. In the Bengal Proper group the death-rate declined from 13·29 to 8·80, which was the lowest of all, in Agra and Central India from 21·72 to 16·37, in the Punjab from 18·51 to 15·01, and in Quetta district from 9·95 to 9·41.

Of the garrisons in the Bengal Command, with a strength of over 1,000, eight returned higher death-rates than that of the Presidency, Bareilly coming first with 28·07, followed by Agra 22·62, Meerut 21·73, Allahabad 21·60, Lucknow 20·15, Rawal Pindi 19·15, Umballa 17·70, and Sialkot 15·54.

Madras Army.

There was a great improvement in the health of the Madras troops as compared with the results of the previous year, only the constantly-sick rate showing a slight increase of 1 per 1,000. As in Bengal and Bombay venereal diseases and ague caused the majority of the admissions, the former yielding 34 per cent. of the total admissions, and the latter 19 per cent. Among the death causes enteric fever was the chief, contributing 28 per cent. of the total deaths against 22 per cent. in 1889.

Bombay Army.

In the Bombay Army also all the ratios except that of invaliding were lower than in 1889, the death-rate (9·56 per 1,000) being the lowest on record. Chief among the diseases causing admissions were venereal diseases and ague, together yielding 58 per cent. of the total. Of the deaths 20 per cent. resulted from enteric fever.

Of the five geographical groups of stations occupied by European troops of the Madras and Bombay Armies, the Rajputana, Malwa, Sind, and Aden group recorded an admission-rate of 1,466 per 1,000 against 1,577 in 1889, and a death-rate of 10·45 against 20·47. The decrease occurred chiefly under enteric fever, the death-rate from which fell from 9·46 per 1,000 to 2·52. In the Deccan and Nagpur group the ratio of admissions to hospital per 1,000 of average strength was 1,250 against 1,286 in 1889, and the death-rate 7·36 against 14·20. The decrease in the mortality was chiefly due to the absence of cholera, from which there were 19 deaths in 1889, giving a ratio of 2·00 per 1,000. The Southern India group recorded an admission-rate of 1,440 per 1,000 against 1,361 in 1889, and a death-rate of 9·73 against 10·71. Among the Madras and Bombay troops serving in Burma during 1890 the admissions were in the ratio of 1,743 per 1,000 against 1,903 in 1889, and the death-rate 20·80 against 29·22. The chief causes of mortality in this force were enteric and remittent fevers, with death-rates of 5·94 and 2·97 per 1,000 respectively. The health of the troops in the Hill Stations of Madras and Bombay was not so good as in 1889, the admission-rate having increased from 1,304 per 1,000 to 1,427, and the death-rate from 5·83 to 9·21. There were only 12 deaths in this force with an average strength of 1,303, and five of these were from enteric fever against three in the previous year.

Of the stations in Madras and Bombay, with a strength of over 1,000, only one returned a death-rate higher than that of its Presidency, viz., Mhow, with 12·73, which, however, was less than half its ratio (26·84) in 1889.

Cholera.

Of the chief diseases, cholera was less prevalent among the European troops in India in 1890 than in the previous year. The admissions to hospital from the disease numbered 58, equal to 0·9 per 1,000 of average strength, and the deaths 49 or 0·72 per 1,000 against 103 or 1·5 per 1,000 and 78 or 1·13 respectively in 1889. Among the troops in the Bengal Army there were 50 cases of cholera with 41 deaths, the latter being in the ratio of 0·99 per 1,000 of strength against 36 deaths, or 0·84 in 1889. Six out of the seven groups of stations in this Command were affected by the disease, Quetta district having been free. Of the total 41 deaths, 13 occurred at the single station of Lucknow.

The Madras Army was almost exempt from the disease in 1890, only one case, which terminated fatally, having occurred. In the previous year there were 30 cases and 25 deaths, equal to 1·84 per 1,000 of strength. In the Bombay Army the admissions to hospital from cholera fell from 26 to 7, and the deaths from 17 or 1·33 per 1,000 to 7 or 0·55. Three of the deaths occurred among the troops stationed at Mhow, and three at Nasirabad.

Small-pox.

Among the whole of the European troops in India there were during the year under notice only 36 cases of small-pox, of which 4 were fatal, as compared with 153 cases

and 17 deaths in 1889. Three of the deaths occurred in the Bengal Army and one in the Bombay Army.

From intermittent fever the admissions to hospital among the European troops in 1890 were in the ratio of 354 per 1,000 of strength against 334 in the previous year. The deaths under this head numbered 11, a decrease of two on the mortality of 1889. Of these 8 occurred among the Madras troops. Fevers.

From enteric fever the admissions declined from 1,584 or 22·9 per 1,000 of strength to 1,253 or 18·5, and the deaths from 423 or 6·11 per 1,000 to 333 or 4·91. In all three Armies the mortality was less than in 1889, but especially in Bombay. The Bengal Army recorded a death-rate under this head of 6·26 per 1,000 against 6·68 in 1889, the Madras Army 3·65 against 4·48, and the Bombay Army 1·88 against 5·93. As usual, young and unacclimatised soldiers were the chief sufferers, those under 25 years of age yielding a death-rate of 7·78 per 1,000 against 9·81 in 1889, while among men between 25 and 29, and from 30 to 34, the mortality was 2·84 and 1·18 per 1,000 respectively. Among men of less than two years' residence in India the death-rate declined from 11·65 to 10·21 per 1,000, among men of three to five years from 4·20 to 2·98, and among troops of from six to ten years from 2·43 to 2·17.

The admissions from dysentery and diarrhœa among the European troops were in the ratio of 59 per 1,000 of strength or 7 per 1,000 less than in 1889, and the death-rate 0·78 against 0·90. Although there were no deaths from diarrhœa in the Madras Army, its death-rate from dysentery (0·95) was much higher than that of either Bengal or Bombay from both causes. Bowel complaints.

Venereal diseases continued to stand first in the list of causes of admission to hospital and of invaliding. No less than 33 per cent. of the admissions during 1890 were recorded under this head, and 13·2 per cent. of the invaliding of the European Army of India. The ratio of admissions from venereal diseases per 1,000 of strength was 504, or 22 above that of 1889. This means that more than one half of the total number of European troops in India in 1890 were in hospital at one time or another from this one cause alone. The increase was participated in by all three armies. In Bengal the admission-rate rose from 491 to 504 per 1,000, in Madras from 452 to 491, and in Bombay from 481 to 515. Venereal diseases.

The loss to the whole army by invaliding during 1889 amounted to 1,715 men, equal to 25·29 per 1,000, against 1,789 or 25·92 in 1889. The proportion of invalids to strength was least in Madras (22·68 per 1,000) and highest in Bombay (28·87), that of Bengal being 25·05. Of the total number invalided 35 per cent. were discharged as being unfit for further service. As regards the influence of age and length of residence in India upon invaliding, 53·04 per cent. of the number were under 25 years of age, against 50·06 in 1889, while 30 per cent. of the total number invalided were of less than two years' service, and 82 per cent. were of less than five years' service. In the European Army as a whole 78 per cent. of the total strength had seen less than five years' service. Invaliding.

II.—NATIVE ARMY.

Sickness and mortality in 1890.

The health of the Native Army of India during 1890 was very unsatisfactory, and all the ratios, as shown below, were higher than in the previous year, which was not a very healthy one.

The ratios of sickness and mortality of each section of the Native Army of India for 1890 and the previous year are given in the following table :—

		Average Strength.	Ratio per 1,000 of Average Strength.			
			Admissions.	Daily Sick.	Deaths.	Total Deaths, including Absentees.
Bengal Native Army	1890	64,080	1,306	42	19·16	21·82
	1889	65,360	1,116	37	12·96	16·30
Madras ditto	1890	26,032	924	41	15·63	20·64
	1889	26,808	856	37	19·21	23·99
Bombay ditto	1890	24,032	1,139	35	10·99	12·92
	1889	23,993	1,024	33	8·13	10·74
Corps of Central India and Rajputana	1890	5,118	702	21	9·96	9·96
	1889	5,159	801	21	7·56	9·29
Hyderabad Contingent	1890	7,071	553	17	4·81	6·71
	1889	6,983	555	19	8·65	9·48
INDIA	1890	127,746	1,137	39	15·91	18·64
	1889	128,642	1,003	35	12·94	16·19

As usual the Hyderabad Contingent and the Central India Irregular Force were the healthiest branches of the Native Army. The troops in the Bengal Command returned the highest death-rate, which was to some extent due to the unhealthiness of troops serving in Upper Burma. The chief cause of sickness in the Native Army as a whole was ague, which caused 46 per cent. of the total admissions. Among the diseases from which the admissions to hospital were higher than in 1889 were cholera, influenza, malarial and simple continued fevers, and respiratory diseases; while from small-pox, enteric fever, and dysentery, there was a decrease in the admissions. Respiratory diseases continued to be the chief causes of death in the Native Army, the ratio being 4·62 per 1,000 of average strength against 3·14 in 1889. The average of 1890 was made up of ratios ranging from 6·24 in Bengal to 1·65 in Madras. Pneumonia alone accounted for 506 deaths or 3·96 per 1,000 of strength. The mortality of Native soldiers from this disease was more than four times as great as that of the European soldiers. From malarial fevers there were 359 deaths among the Native troops, equal to 2·81 per 1,000. Under these two heads, pneumonia and malarial fever, 42 per cent. of the total deaths were registered. From cholera the death-rate was 1·83 per 1,000 against 0·68 in 1889. Fevers of all kinds were the cause of 18 per cent. of the total deaths, against 40 per cent. among the European troops. From ague, remittent and simple continued fevers, the deaths among the Native troops were in the ratio of 2·87 per 1,000, while among the European troops the proportion was only 0·64. On the other hand the death-rate from enteric fever among the Native troops was only 0·7 per 1,000 as compared with 4·91 among the European troops, and 0·09 among prisoners in jail. "It appears, then," the Sanitary Commissioner with the Government of India (Dr. Rice) states, "that Native soldiers and prisoners are less liable to contract "enteric fever than Europeans are. This might be due to: 1st. Racial peculiarity, of "which evidence is wanting; 2nd. Acquired tolerance from constant contact with the "specific poison. The constant presence of the bacillus in the surroundings of native "life remains to be demonstrated. No length of time spent by generations amid "non-specific filth would confer relative insusceptibility. The most defective "sanitation cannot of itself produce enteric fever; but it renders possible and likely "the presence of the specific filth where it ought not to be, and its conveyance into

"the human body; 3rd. Comparative immunity of Native adults as a result of "prevalence of the disease among Native children. This view is held by some "European and Native medical men, who also see in the contamination of water, "milk, &c., by the excretions of the affected Native children, the main source of the "enteric fever that scourges the European garrison of the country. No settlement of "this point can be approached till more is accurately known regarding the infantile "diseases of Natives."

Bengal Native Army.

The health of the Native Army of Bengal in 1890 deteriorated very much. There was considerably more sickness, and the death-rate rose from 12·96 per 1,000 in 1889 to 19·16 in 1890, this ratio being the highest recorded for some years, and was due in some measure to the extreme unhealthiness of the Bengal troops serving in Upper Burma. The average strength of this portion of the Bengal Native Army was 1,754, and the death-rate 78·68 per 1,000, of which cholera contributed 24·52. Pneumonia caused 28 per cent. of the total deaths in the Bengal Native Army, and cholera 17 per cent., the death-rate of the latter being 3·28 against 0·38 in 1889. Dysentery also contributed a larger mortality.

The following statement gives the principal statistics of the regular troops in Bengal, arranged in geographical groups, for 1890 and the preceding year:—

		Average Strength.	Ratio per 1,000 of Average Strength.		
			Admissions.	Daily Sick.	Deaths.
Bengal Proper and Assam	1890	6,273	1,869	41	24·58
	1889	6,790	1,199	40	13·38
Gangetic Provinces	1890	6,684	862	31	7·91
	1889	6,223	615	30	3·84
Rohilkund and Meerut	1890	6,672	1,150	34	17·24
	1889	6,590	853	32	9·56
Agra and Central India	1890	5,870	962	39	14·00
	1889	5,871	1,146	41	10·39
Punjab	1890	21,284	1,056	24	17·72
	1889	21,957	896	30	8·79
Punjab Frontier Force	1890	12,426	1,693	36	18·62
	1889	12,452	1,493	39	14·62
Quetta District	1890	1,133	2,065	40	27·36
	1889	1,244	1,401	43	24·92

Of the seven groups of stations in the Bengal Command, Quetta district and the Bengal Proper and Assam groups ranked first in both sickness and mortality, the death-rate of the latter being considerably in excess of the previous year. All the groups, except Agra and Central India, recorded higher admission-rates than in 1889, and all much higher death-rates, except the Gangetic Provinces, in which there was a slight improvement. Of the large stations with a strength of not less than 1,000, the six following returned death-rates above the Presidency ratio, Dharmsala 93·84 against 15·23 in 1889, Dehra Dun 37·20 against 19·34, Quetta 34·58 against 23·83, Dera Ismail Khan 31·30 against 17·32, Agra 28·78 against 26·49, Meean Meer 20·49 against 27·97, and Jahnsi 20·24 against 9·32.

Corps of Central India and Rajputana.

The health of the corps of Central India and Rajputana (average strength 5,118) was not on the whole so good as in 1889. The admission-rate fell from 801 to 702 per 1,000, but the death-rate rose from 7·56 to 9·96. Ague was the cause of 38 per cent. of the total sickness. Pneumonia and remittent fevers were the principal death causes, the former having accounted for 39 per cent. of the total mortality and the latter 11 per cent.

Hyderabad Contingent.

Among the troops composing the Hyderabad Contingent there was slightly more sickness but a much lower mortality than in 1889. Of an average strength of 7,071, the admissions to hospital were equal to 553 per 1,000 of strength against 555, and the death-rate was 4·81 against 8·65. Ague was the chief cause of sickness, yielding 28 per cent. of the total admissions; and pneumonia was the principal cause of

mortality, yielding 29 per cent. of the total deaths. There was no cholera among these troops during 1890.

Madras Native Army.

The health returns of the Madras Native Army were again materially affected by the inclusion of the statistics of troops on service in Upper Burma. The ratio of admissions to hospital per 1,000 of an average strength of 26,032 was 924 against 856 in 1889, the daily sick-rate was 41 or 4 per 1,000 more, but the death-rate fell from 19·21 to 15·63 per 1,000. Ague was the cause of 38 per cent. of the total sickness. From cholera there were only 14 deaths, equal to 0·54 per 1,000, against 39 or 1·45 in 1889. Malarial fevers caused 24 per cent. of the total deaths, debility 12 per cent., and dysentery and pneumonia each 9 per cent. None of the death-rates of the large garrisons exceeded the Presidency ratio. Among the Madras troops in Upper Burma during 1890 the death-rate was 40·49 per 1,000.

Bombay Native Army.

The health of the Bombay Native Army in 1890 was not so satisfactory as in the previous year. Of an average strength of 24,032 the admissions to hospital were in the proportion of 1,139 per 1,000 against 1,024 in 1889, the daily sick-rate was 35 or 2 per 1,000 more, and the death-rate 10·99 against 8·13. Ague caused 40 per cent. of the total admissions. Pneumonia was the chief cause of mortality, contributing 34 per cent. of the total deaths. Of the larger garrisons in this Command with a strength of over 1,000, two recorded a higher mortality than the Presidency, namely, Quetta 25·42, and Aden 16·80.

III.—GENERAL POPULATION.

Vital statistics.

Births were registered throughout all the provinces of India during 1890 excepting Lower Bengal, where the system of limited registration still remained in force, and was confined to 142 of the total 145 municipal towns. The provincial birth-rates varied between 15·25 and 42·5 per 1,000 of population. The highest results were obtained in Berar, which recorded a birth-rate of 42·5; next in order came the North-Western Provinces and Oudh 39·70, the Punjab 39·08, Bombay 38·97, and the Central Provinces 38·41. In all provinces except Bengal, the Punjab and Coorg, the birth-rate exceeded the death-rate. On the whole, the year was much more unhealthy than 1889, and the total deaths in the 10 provinces rose from 5,460,071, or 28·05 per 1,000 of population under registration, to 5,848,122, or 30·14. The increase occurred chiefly in the Punjab, and the North-Western Provinces and Oudh, the death-rate of the former having risen from 31·62 to 46·87, and of the latter from 31·11 to 37·27. From all the chief diseases except fevers the deaths were fewer than in 1889. Under this head there was an increase of 568,494 deaths, or nearly 3 per 1,000, which were spread over all the provinces except the Central Provinces, and was attributed partly to deaths from influenza and its sequelæ being recorded under fevers. Cholera was much less fatal than in 1889. The decrease was participated in by all the provinces, except the Punjab and the North-Western Provinces, where there was a slight increase. The greatest improvement occurred in the Central Provinces, where the cholera death-rate declined from 5·96 per 1,000 in 1889 to 0·54, and in Berar from 4·16 to 0·32. There was also a noticeable decrease in the mortality from small-pox in 1890 as compared with the previous year.

The deaths from the chief diseases and from all causes in the several provinces were as follows:—

	Cholera.		Small-pox.		Fevers.		Bowel Complaints.		Deaths from all Causes.		
	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000 of Population under registration.	
										1890.	1889.
Bengal, excluding Calcutta	145,885	2·21	12,619	0·19	1,155,569	17·54	43,451	0·65	1,612,479	24·48	24·25
Calcutta	963	2·17	700	1·57	4,154	9·32	1,311	2·95	12,382	27·53	26·97
North-Western Provinces and Oudh	30,295	1·82	55,394	1·26	1,244,326	28·21	53,604	1·22	1,644,027	37·27	31·11
Punjab	3,461	0·18	8,922	0·47	692,511	36·75	17,163	0·91	883,149	46·87	31·62
Lower Burma	1,076	0·29	3,695	1·01	32,232	8·82	3,007	0·84	63,591	17·40	17·67
Central Provinces	4,787	0·54	2,265	0·26	191,888	21·76	17,721	2·01	336,764	38·53	43·79
Coorg	5	0·03	34	0·19	3,837	21·52	233	1·30	4,515	25·32	22·92
Assam	15,396	3·40	1,461	0·31	74,779	16·52	13,015	2·87	134,195	29·64	30·70
Madras	35,288	1·23	28,092	1·02	262,855	9·21	26,606	0·93	650,394	22·80	23·57
Bombay	3,259	0·20	2,877	0·17	344,897	20·96	36,037	2·19	463,616	28·18	31·51
Berar	347	0·32	324	0·12	47,894	18·24	13,328	5·08	93,030	35·49	42·56
Total	291,202	1·50	116,321	0·59	4,054,942	20·90	225,533	1·16	5,848,122	30·14	28·05

Bengal.

Registration of births and deaths in Bengal during 1890 was attended with very indifferent results. Birth registration was still confined to municipalities, and the average birth-rate of 142 out of a total of 145 was 21·54 per 1,000 of population, which was made up of extremes ranging from 53·89 in Madhubani to 1·57 in Jungipore. Estimating the birth-rate at 40 per 1,000, only seven municipalities reached this standard. In their resolution on the Sanitary Commissioner's (Dr. Gregg) Report, the Local Government remark: "Comparing the birth-rate with the recorded death-rate of the "year, the singular result is arrived at that, while the Census shows the population of "Bengal to have increased during the last 10 years by more than 60 per 1,000, the "municipal birth statistics prove it to be decreasing at the rate of nearly 3 per 1,000."

The year under notice was not so healthy as that of 1889. Cholera was less prevalent, but there was a greater mortality from fevers and small-pox, and the

province suffered from a severe epidemic of influenza. The total number of deaths registered was 1,612,478 or 24·48 per 1·000, against 1,597,478 or 24·25 in 1889. The district ratios of mortality varied from a minimum of 14·62 in the Sonthal Pergunnahs to 40·34 in Darjeeling. The average mortality of the province, however, is estimated to be not less than 34 per 1,000, and assuming this to be correct, the Army Sanitary Commission reckon that about 800,000 deaths must have been omitted from the registration. "It is," the Commission say, "of the highest importance, from a practical "point of view, that decided progress should be made in this important basis of "sanitary work. So far very little has been done, and after many years the results "are not much better than they were when the system was first introduced." The Lieutenant-Governor, however, has made practical suggestions for improvement, which it is hoped will produce early results.

Cholera deaths declined from 171,103 or 2·59 per 1,000 in 1889 to 145,885 or 2·21. The disease was present almost throughout the year, and affected every district, but in none of the districts did the death-rates come up to those of 1889. The highest ratios were those of Faridpur (8·40), Chumparun (5·99), Bhagulpur (5·18), and Dacca (4·31). Dr. Gregg's Report, the Army Sanitary Commission state, "throws no new light on "the cause of cholera. It emphasises what has long been known, that the extent of "the disease varies enormously in different years, that whatever this extent may be, "its rise and fall are largely dependent on season, and that its incidence is governed "in a great degree by local conditions." In some places the outbreak was attributed to importation. "But whatever may be the truth on this point," the Commission observe, "it is quite clear, especially in a country like Bengal, that no measures directed "against this supposed cause of disease can be taken, and that the only safeguard "consists in removing, as far as possible, all local insanitary conditions."

From small-pox the deaths rose from 8,665 or 0·13 per 1,000 in 1889 to 12,619 or 0·19 in 1890. In no district did the mortality from this disease reach 1 per 1,000. Of the total deaths 18·86 per cent. were of infants below one year, and 45·44 per cent. were of children between 1 and 12 years of age. "Though less than in the previous "year," Dr. Gregg says, "the mortality is very high, chiefly on account of the "difficulty experienced in some districts in inducing parents to have their children "protected. Compulsion cannot always be used, because the Compulsory Vaccination "Act has not yet been extended to rural areas."

There was an increase of 54,048 in the deaths ascribed to fever, the number having risen from 1,101,521 or 15·68 per thousand in 1889 to 1,155,569 or 16·72 in 1890. This was attributed to increased rainfall, excessive floods, and the inclusion under fevers of deaths resulting from influenza. The mortality varied very considerably in the different districts, from a maximum of 31·39 per 1,000 in Julpigoree to 5·35 in Puri. Both the number of fever deaths and the death-rate were higher in 1890 than in any of the previous 16 years, and, with the exception of one or two years, there has been a steady increase year by year in the number of deaths recorded. To some extent this is attributed to better registration, but Dr. Gregg is of opinion that it is also due to greater saturation of the soil with moisture, which is caused by the want of proper drainage, for which the development of roads and railways, the construction of bunds, and the action of fishing weirs, are largely responsible. "The more personal "knowledge," Dr. Gregg says, "I gain of Bengal, the more do I feel convinced that "want of free drainage is one of the principal causes of the excessive unhealthiness of "the province. The matter is under the consideration of the newly constituted Sanitary "Board, but owing principally to the large expenditure required, which is not forth-"coming, nothing has yet been done in this direction, except in a few isolated "instances in the case of towns."

The number of deaths recorded from bowel complaints was 43,451 or 0·65 per 1,000 against 53,079 or 0·80 in 1889. As so many abdominal diseases have come to be included under this head, the Government of India have directed that in future this heading is to be altered to dysentery and diarrhœa, and that all the other diseases hitherto grouped under it be shown under "Other causes."

Calcutta.

In Calcutta the births registered during 1890 were in the ratio of 17 per 1,000 of population. The deaths rose from 11,682 or 26·97 in 1889 to 12,382 or 27·93. This increase in mortality was attributed chiefly to fevers and to epidemics of influenza and small-pox. Cholera was less fatal in the town than it had been for some years, only 963 deaths having been recorded from it against 1,079 in 1889. Fever deaths rose from 3,341 or 7·71 per 1,000 to 4,154 or 9·37, the highest mortality since 1879; small-pox deaths also increased from 71 or 0·16 to 700 or 1·57, a larger number than had been recorded for 10 years.

The year 1890 in the Punjab was extremely unhealthy, and the mortality was greater than in any year since 1868, when the registration of deaths was commenced. There were 146,743 fewer births than deaths registered, the death-rate, therefore, exceeded the birth-rate by nearly 8 per 1,000. The total number of births registered was 736,406, giving a birth-rate of 39·08 per 1,000 compared with 759,049 or 40·28 in 1889, the diminution being attributed to the lamentable sickness in certain districts. The district ratios varied from 50·15 in Sialkot to 13·58 in Simla; but omitting Simla, where there are nearly twice as many males as females, and the frontier districts, where registration is very imperfect, Umballa district recorded the lowest birth-rate, viz., 30·36 per 1,000. Of the 736,406 births registered, the proportion of males was 114·88 to 100 females, but this average was to a great extent affected by the high proportion in the frontier districts, especially in Peshawar, where 166·94 male to 100 female births were registered. Punjab.

The deaths registered in the province amounted to 883,149 or 46·87 per 1,000 of the population, exceeding the number of the previous year by 287,389 or 15·25 per 1,000. This excessive mortality was due entirely to climatic causes. The highest death-rate previously recorded was in 1879, when it reached 38 per 1,000. As usual the registered female mortality was greater than that among males, the excess amounting to 2·79 per 1,000, which is believed to be due to the small value set on female life. "That "female life," the Lieutenant-Governor observes, "should be less valued is to be much "regretted, but it is hard to fix the border line between apathetic treatment and "deliberate criminal neglect, and still more difficult to prove when that line has been "overstepped; in special localities the enforcing of rules under Act VIII. of 1870 "may avail to repress actual infanticide, but a general improvement in the treatment "of female children will only follow the growth of a healthy public sentiment, which "can be but very gradually produced." In the districts mostly affected by fever, the mortality among infants and children was lamentably high, and it was reported that in 59 villages in the Sialkot district every child born during the year died. The Civil Surgeon of Gujrat reported that on visiting, after the fever epidemic, two villages, each of which contained 300 families, he found neither child nor infant alive. As regards the mortality of individual districts, all, with the exception of Gurgaon, recorded higher death-rates than the average of the previous five years, the greatest increases being in Sialkot, Gujranwala, Gujrat, Gurdaspur, Amritsar, and Lahore. The death-rate of Sialkot in 1890 reached 102·07 per 1,000, exceeding the average of the previous five years by 71 per 1,000, and in Gujranwala and Gujrat, with death-rates of 83·01 and 78·96 respectively, the excess in each was over 50 per 1,000. In the remaining districts the death-rates ranged from 65·67 in Gurdaspur, and 53·50 in Amritsar, to 18·40 in Dera Ghazi Khan. The death-rate of the 49 principal towns of the province was 47·72 per 1,000, or 10·72 higher than in 1889. The town of Gujrat registered the highest death-rate, viz., 129·11 per 1,000, followed by Nasirabad, in the Gujranwala district, with 84·25, and Julalpur, in Gujrat district, with 75·08. The average death-rate of the rural areas was 46·82 per 1,000.

Of the chief diseases, cholera was slightly more prevalent than in 1889, the deaths having increased from 2,838 or 0·15 per 1,000 to 3,401 or 0·18. The disease was widely distributed, 20 out of 31 districts having recorded deaths from it, though only 34 municipal towns and 269 villages were affected, and only in two districts did the mortality exceed 1 per 1,000. The mortality in the municipalities was in the ratio of 1·17 per 1,000 of population, and in the villages 7·72. "The comparative immunity "of the towns in which the disease appeared," the Local Government remark, "is "some indication of the value of their sanitary arrangements, because the urban "mortality from all causes has nearly always been higher than that of the rural areas, "and the arrest of cholera in the towns shows that, at any rate, some degree of "cleanliness has been attained." The Sanitary Commissioner of the province, Surgeon-Major Stephen, suggested that cholera was introduced into several districts by pilgrims returning from Hurdwar by train, "but the fact," the Government of India state, "that the pilgrims dispersed on the 13th April, and that the first casualties in these "districts did not occur till the end of June, or the beginning of July, throws doubt "on the correctness of this explanation." And the Army Sanitary Commission, in their memorandum on the Sanitary Commissioner's Report, state that they can discover no facts to show that the epidemic of 1890 was affected by the railways. "If it "could be shown," they say, "that the railways are the great disseminators of disease, "they would certainly be far from an unmixed blessing to the people, but there is no "evidence of the kind. The problem to be solved is whether the improved means of "communication have rendered epidemics of cholera in India more rapid and wide-

"spread than they used to be, and the facts, so far as we are acquainted with them, "entirely negative any such supposition."

The number of deaths registered under small-pox was 8,922 or 0·47 per 1,000 of population, against 7,928 or 0·42 in 1889. Though there was an increase of nearly a thousand deaths in 1890, the history of the disease during 23 years gives ground for believing the Army Sanitary Commission observe, that vaccination is exercising considerable protective influence, as, during the last 11 years, there has been nothing like the mortality of 49,489 persons from small-pox in 1879, or 53,195 in 1869. But the fact that all the 8,922 deaths, except 706, occurred among children under 12 years of age certainly shows that a large proportion of the juvenile population is not protected by vaccination. The districts which suffered most were Karnal, Gurgaon, Simla, Sialkot, and Umballa, the first of these recording the maximum ratio of 1·99, which was due to defects in the Vaccination Department.

The number of deaths registered under fevers was higher by nearly 220,000, than in any previous year. In 1890 there were 692,511 deaths, being in the ratio of 36·75 per 1,000 against 428,712 or 22·75 in 1889, nearly one-half of the number having been recorded in the three months September, October, and November. The districts most affected were Sialkot, Gujrat, and Gujranwala, with fever death-rates of 83·94, 76·46, and 69·87 per 1,000 respectively, but the fever mortality was higher than the average of the previous five years in every district of the province with the exception of Delhi and Gurgaon. In certain parts of the above three districts, Surgeon-Major Stephen says, the sickness and mortality were almost phenomenal, "and in the worst "tracts not a single person seemed to have escaped an attack of fever. There was "scarcely a family in which one or more deaths had not occurred, and in a considerable number of villages every infant had died. When I visited the village of "Satrah, in the Sialkot district, on the 26th October, there were several square miles "of rice fields in which the crops were breaking down from being over-ripe, and the "villagers were so weak that they could not reap them." In the registration circle of Satrah, during the above period of three months, the mortality was at the annual rate of 492 per 1,000, and in the municipal town and the rural registration circle of Gujrat the fever mortality for the same period was at the annual rate of 405 and 344 per 1,000 respectively. The great increase in the number of fever deaths was attributed partly to the exceptionally heavy rainfall of the year, and partly to influenza. In the districts where the fever epidemic was most severe, the rainfall during the third quarter of the year was double the average of the corresponding period of the previous five years. Surgeon-Major Stephen reports that he visited the districts of Sialkot, Gujrat, and Gujranwala when the outbreak was at its height, and he invariably found that the highest mortality occurred in those places in which, from local causes, water-logging was most pronounced. This is a matter, the Local Government remark, which will require the careful attention of the Sanitary Board, "for with the development "and extension of canal irrigation the tendency, in the more level areas, is for the "subsoil to become gradually water-logged, and for malarial fevers, with spleen "disease, to increase."

The number of deaths recorded from dysentery and diarrhœa, formerly known under the head of bowel complaints, was 17,163 or 0·91 per 1,000. In the previous year 18,066 deaths were registered under bowel complaints, being in the ratio of 0·96 per 1,000 of population. It is doubted whether the numbers registered represent the actual mortality, as fever, of which dysentery and diarrhœa are so frequent a complication, was so prevalent.

North-Western Provinces and Oudh.

The year 1890 was exceptionally unhealthy in the North-Western Provinces and Oudh; the rainfall was above the average, and in the early part of the year an epidemic of influenza contributed largely to the death-rate. There were 1,751,168 births registered during the year, giving a ratio of 39·70 per 1,000 of population against 1,629,210 or 36·93 in 1889. The Sanitary Commissioner, Dr. Hutcheson, considers the general results of the registration of vital statistics in the united provinces as approximately accurate. That there is still much room for improvement, however, is shown in the district ratios, which ranged from 24·26 in Dehra Dun to 51·43 in Hardoi. Considering the machinery available, the Army Sanitary Commission are of opinion that registration in the provinces has made very creditable progress. "Constant inspection of the registers," they suggest, "and a comparison of the entries "with the facts which may be elicited on the spot, and with the vaccination returns, "are among the best means of obtaining more perfect results."

The number of deaths registered rose from 1,372,269 or 31·11 per 1,000 to 1,644,027 or 37·27, showing an increase of 6·16 per 1,000 in the death-rate of 1890. The mortality among children under five years of age was very high, being in the proportion of 43 per cent. of the total deaths. In 27 of the 49 districts there were more births than deaths, and the excess ranged from 14·31 per 1,000 of the population in the Hardoi district to 0·62 in the Bareilly district. In the other districts the excess of deaths over births ranged from 21·72 in the Tarai, and 14·25 in the Fatehpur district, to 0·15 in the Moradabad district. The district death-rates varied between 54·97 in the Tarai, followed closely by Jhansi and Fatehpur with over 50 per 1,000 each, and 24·81 in Ghazipur. The rural death-rate was 36·99, whilst the urban was 41·12 per 1,000.

Cholera was considerably more fatal in the provinces than in the previous year, the number of deaths having risen from 48,494 or 1·09 per 1,000 to 80,295 or 1·82. All the districts except Lalitpur returned cases, and the mortality was excessive in five, viz., Kheri, Pilibhit, Shahjahanpur, Moradabad, and Bahraich, the two first having recorded cholera death-rates of over 10 per 1,000, and the remaining three of over 5 per 1,000. In seven other districts the death-rate was above 2 per 1,000. Contrary to usual experience the epidemic was severe in the hills and in the districts more immediately underlying the hills. The Sanitary Commissioner writes: "The facts elicited in the "investigation of cholera during 1890 are important in their practical bearing. There "is no safety against virulent epidemic outbreaks wherever there is an unprotected "water-supply. The prevention of cholera is only attainable by a system of more or "less perfect sanitation and isolation, and careful treatment of first cases before they "can possibly become a centre of infection. In the extirpation of cholera, with its "short incubation and rapid course, the chief reliance must always be placed in "prevention, and any rational prophylaxis must aim at the careful treatment of "suspicious cases of diarrhœa and the protection of the water-supply, &c., against "pollution and contamination."

The deaths from small-pox were also more numerous than in 1889; still there has been no recurrence of the severe epidemics of the disease in 1883 and 1884, which is attributed to the extension of vaccination. The deaths registered from small-pox in 1890 numbered 55,394 or 1·26 per 1,000 against 48,243 or 1·09 in 1889. The mortality was heaviest in Rae Bareilly district (5·45) and Partabgarh (4·15), both in Oudh; in Budaun, Fatehpur, Fyzabad, and Gonda it exceeded 3 per 1,000, and in Etawah, Etah, Bijnor, and Sultanpur it was over 2 per 1,000. Dr. Hutcheson, in his report for 1890, gives a table showing the mortality from small-pox in the several districts for 21 years. Some of the districts appear to have yielded deaths in every year, while others, except in a year or two now and then, have been exempt. The most notable cases of exemption are Kumaun, Garhwal, and Dehra Dun. In respect of the relation of vaccination to small-pox, the experience of these districts, as the Army Sanitary Commission notice, is most satisfactory; "there is, indeed," they say, "no portion of India where the results of vaccination have been more eminently "successful. . . . But in respect of most of the provinces, it seems too early "yet to conclude that vaccination has been sufficiently general to check epidemic "outbursts of the disease."

Fevers gave rise to 1,244,326 deaths, or 28·21 per 1,000, against 1,018,928, or 23·10, in 1889. The increase was attributed chiefly to influenza, which greatly increased the mortality in the spring, and to excessive rains which aggravated it in the autumn. The highest district rate (47·79) was recorded, as usual, in the Tarai. Excessive rates were also returned by the contiguous districts of Muzaffarnagar and Saharanpur, viz., 44·32 and 42·79 respectively; while of the total 49 districts 24 returned fever death-rates above 30 per 1,000. There can be no doubt, however, that deaths from other causes are included under the head of fever, as is shown in the case of Meerut district, with a recorded fever death-rate of 39·64 out of a total mortality of 40·78. "The term fever," Dr. Hutcheson states, "has been held to signify, or be more or less "synonymous with, malarial fever. But the heading fever in the statistical returns "of the province includes deaths from a variety of causes, and is no indication of the "actual mortality from malarial, or other fevers, of medical nomenclature. The fever "rates therefore indicate the general mortality from fever and general causes, and not "that from specific and malarious fevers only." Dr. Hutcheson believed that many deaths recorded under fever in the early part of the year were due to influenza. Of the total increase of 225,398 deaths from fever during the year, 132,689 or 58 per cent. occurred in the first six months. The excessive mortality during this period was reported to be due to unusual causes.

Under dysentery and diarrhœa there were 53,604 deaths registered, equivalent to 1·22 per 1,000 of the population as compared with 56,447 or 1·28 in 1889. The districts of Garhwal and Lalitpur were again the chief sufferers, with death-rates of 9·48 and 8·77 respectively. But registration under this head is still very imperfect, as is shown by the fact that no deaths were recorded in seven towns with an aggregate population of 79,861, and only two in Jaunpur and Mainpuri with an aggregate population of 65,581.

Burma.

The vital statistics of Lower Burma for 1890 show little evidence of improvement in registration. The number of births registered during the year was 84,769 or 23·20 per 1,000 against 77,296 or 21·15 in 1889. This average rate was made up of district ratios ranging from 12·95 per 1,000 in Toungoo to 36·63 in Tharawaddy. The registered deaths numbered 63,591 or 17·40 per 1·000 against 62,358 or 17·07 in 1889. Similar variations appeared in the district death-rates as in the birth-rates, the provincial ratio of mortality being made up of extremes ranging from 10·51 in Amherst to 33·43 in Hanthawaddy. In 20 towns with populations of over 5,000, where special registers of births and deaths are kept, the ratio of births was 20·57, and that of deaths 29·74 per 1,000. Measures, however, were being taken for securing a more efficient system of registration in the province.

From cholera the mortality was exceptionally small, the deaths amounting to only 1,076 or 0·29 per 1,000, a lower ratio than had been recorded for 14 years. In 1889 there were 3,242 deaths from the disease in the province. The decrease was common to all the four divisions, but was most marked in Tenasserim, where the deaths declined from 1,422 to 151. As in 1889 the Arakan division enjoyed almost complete immunity from the disease, only one death having been recorded among a population of 562,725. Of the districts, Thongwa and Bassein, which suffered severely in 1889 again returned the highest death-rates, viz., 1·14 and 0·62 respectively.

The mortality from small-pox was greater than in 1889 by 881, there being 3,693 deaths in 1890, equal to 1·01 per 1,000 of population against 2,812 or 0·77. Of these 80 per cent. were children under 12 years of age. The district of Prome, with a death-rate from this cause of 4·53, suffered most, while Akyab, Tavoy, and Mergui were exempt. As the Vaccination Act is now in force in Prome better results may be expected in future.

Fevers also were more prevalent than in the previous year, the number of deaths being 32,232 or 8·82 per 1,000 against 30,343 or 8·30 in 1889. Compared with other provinces (except Madras, where the fever death-rate was only 9 per 1,000), this is a singularly low rate. The district fever death-rates varied very considerably, from 3·91 in Thongwa to 14·23 in Thayetmyo, and the town ratios showed still greater variations. The Army Sanitary Commission suggest that such differences should be inquired into. Either the registration, they say, is defective, or there are local conditions of the places suffering most which need remedying.

Under dysentery and diarrhœa there were 3,067 deaths registered, against 3,088 in 1889, the death-rate in both years being identically the same (0·8). As in the case of fevers there were the same extremes in the district and town ratios. The districts of Sandoway and Hanthawaddy recorded the highest death-rates from these causes, viz., 3·33 and 3·15 per 1,000 respectively.

Central Provinces.

The public health of the Central Provinces in 1890 was much better than in the previous year. There was no real scarcity in any part of the province, and there were no widespread epidemics of a severe type. The number of births registered was 338,644 or 38·41 per 1,000 of population, being 7,871 less than in the previous year, indicating, the Local Government remark, that the effect on the population of the unusual sickness of 1889 was more than temporary. The decrease extended to 10 of the 20 registering districts, and was most marked in Chanda, Bhandara, Jubbulpore, and Damoh. In 15 districts the birth-rate exceeded the death-rate, the excess ranging from 1·20 to 17·77 per 1,000. The district birth-rates varied between 31·95 in Damoh and 49·77 in Nimar.

From all the chief diseases, but especially cholera, the mortality was less than in 1889, and the total deaths declined from 386,155 or 43·79 per 1,000 to 286,754 or 32·52. The decrease was distributed over all the districts except Chhindwara and Balaghat, and was most marked in Chanda and Bilaspur, where it was equal to 21·11 and 20·95 per 1,000 respectively; in six other districts the decrease was more than 11 per 1,000 in each. As usual there were great extremes in the district ratios, which ranged from 20·18 per 1,000 in Bilaspur to 42·88 in Narsinghpur. Notwithstanding the care that is devoted to the collection of vital statistics in these provinces, there is

still room for improvement, especially in municipalities whose average birth and death rates were lower than those of the province generally.

Deaths from cholera were much fewer than in 1889, namely, 4,787or 0·54 per 1.000 against 52,588 or 5·96. All the districts were affected except Balaghat, but Narsinghpur was the only district which suffered severely, its death-rate from the disease being 4·23 per 1,000, or three times greater than in any other district. The disease first appeared in Narsinghpur in February, and increased in virulence with the progress of the hot weather, abating with the advent of the rains, and dying out in September. But although cholera was reported from every district except one, the area affected was greatly reduced. Out of 29,012 villages in the province only 623 returned cholera deaths.

The mortality from small-pox was lower than in any year since 1873 except 1881, when the ratio stood at 0·21 as against 0·26 in 1890. The total number of deaths registered from the disease during the year under notice was 2,265, or 15,264 less than in 1889, and of these nearly one-third occurred among infants under one year of age. The district ratios ranged between 0·05 and 1·31, Seoni being the chief sufferer, but with this exception the mortality in each district was much below the mean for the whole province for the previous five years.

The deaths ascribed to fever declined from 203,052 or 23·03 per 1,000 in 1889 to 191,888 or 21·76, and this notwithstanding an epidemic of influenza, the deaths from which were classed as the result of fever. The highest fever death-rate registered in any district was 31·47 per 1,000 in Mandla, and the lowest 7·40 in Sambalpur. The Sanitary Commissioner, Surgeon-Major Pilcher, states that "the mortuary statistics " of the province afford no clue to the various types of fever which prevailed, but the " returns of dispensaries and police hospitals show that intermittent, remittent, and " continued fevers were the most commonly treated." He agrees with the Civil Surgeon of Jubbulpore, who attributes the excessive mortality of fevers to the low standard of comfort among the poorer classes of the agricultural population, who are ill-fed and insufficiently clothed, and to the common custom of abstaining from food till the fever has passed off. From inquiries made by Civil Surgeons, it would appear that about a fourth of the deaths from bowel complaints and other causes are returned under fevers.

There was also a diminished fatality from dysentery and diarrhœa, the deaths having fallen from 25,874 or 2·94 per 1,000 in 1889 to 17,721 or 2·01. All the districts but one, Mandla, shared in the decrease. The district ratios ranged from 4·84 in Murwara to 0·35 in Bilaspur; the provincial average mortality was exceeded in ten districts.

The registration of vital statistics in Assam continued to be very defective, and it was particularly so in sadr and sub-divisional towns where registration is compulsory. For example, the town of Balaganj, with a population of 2,769, recorded no births, and only four deaths. The Chief Commissioner of the province has called for an explanation of this and similar cases. The total number of births registered in the province during 1890 was 138,326 or 30·56 per 1,000 against 141,236 or 31·20 in 1889, this average being made up of district ratios ranging from 23·34 in Kamrup to 34·69 in Cachar. All the districts except Sylhet and Kamrup shared in the decrease, which in some places was partly accounted for by cholera epidemics, and in others to the prevalence of the disease called kala-azar. Assam.

The registered deaths were fewer by 4,791 or 1·06 compared with the previous year, the number for 1890 being 134,195 or 29·64 per 1,000. Of the three natural divisions of the province, it would appear that the Surma Valley is becoming more healthy, and that the mortality in the Assam Valley is increasing, for while the death-rate of the former fell from 32·25 in 1889 to 27·14 in 1890, in the latter it increased from 29·18 to 32·23. In the hills the mortality was practically the same in both years. In only three out of the nine districts were the death-rates below the provincial average. Sibsagar returned the highest mortality (36·37), followed by Kamrup (32·97), and Goalpara (32·58). In the first of these three districts the high death-rate was attributed partly to epidemic cholera, and in the other two partly to kala-azar.

The deaths from cholera were fewer than in the previous year by 2,892, the number having fallen from 18,288 or 4·04 per 1,000 to 15,396 or 3·40. More than a fourth of the deaths occurred in Sibsagar district, its death-rate being 11·58 or 8·16 higher than in 1889. Nowgong and Kamrup also suffered severely from the disease, returning death-rates of 9·91 and 4·89 respectively. The outbreak in Sibsagar was attributed to the importation of cholera into the Rajabari garden (six miles from Sibsagar), by coolies from Bengal. But in the opinion of the Army Sanitary Commission the evidence adduced does not warrant this conclusion. "Supposed importation offers, no doubt,

" they say, to some minds a very easy solution of all the difficulties connected with " the origin of epidemics; but, especially in India, it affords no basis for practical " measures calculated to prevent them." The Sanitary Commissioner (Dr. Costello), however, has no doubt that the outbreak and spread of the disease was in many cases mainly due to the insanitary condition of the areas in which the outbreaks occurred.

From small-pox there were only 1,401 deaths, being in the ratio of 0·31 per 1,000 of population against 2,244 or 0·49 in 1889. Three fourths (1,046) of the deaths occurred in the districts of Cachar and Sylhet in the Surma Valley, and Dr. Costello attributed this comparatively large mortality to the prevalence of inoculation, a practice which the Local Government were taking steps to prevent.

The deaths registered under fevers amounted to 74,779 or 16·52 per 1,000 against 73,124 or 16·15 in 1889, the increase being attributed chiefly to the development of kala-azar. An investigation into this disease was made by Dr. Giles, and he arrived at the conclusion that it is caused by an animal parasite which multiplies in the intestines of those afflicted. He believes that the disease is the same as beri-beri of Ceylon; that it is spread entirely by the dejecta of those affected, and that little or no benefit is to be derived from medical treatment. "There is only one possible way of dealing " with the disease," he says, "and that is to no longer allow the general fouling of " inhabited sites, in other words, to adopt ordinary measures of conservancy." Dr. Costello is of opinion that Dr. Giles' views as to the cause of the disease are quite accurate, "both kala-azar and beri-beri being due to Anchylostomiasis, the apparent " difference being due to kala-azar being frequently complicated by malarious fever " and its results." The measures recommended by Dr. Giles in way of prevention were under the consideration of the Local Government.

Bowel complaints accounted for 13,015 deaths, equal to 2·87 per 1,000 of population, against 16,048 or 3·55 in 1889. There was thus a decrease in 1890 of 3,033 deaths, which was common to all the districts, except Goalpara, where there was a slight increase.

Madras.

The vital statistics collected in Madras Presidency during 1890 indicate improvement in registration, but they are still far from being accurate. The number of births registered rose from 867,523 or 30·9 in 1889 to 893,645 or 31·3 per 1,000. The birth-rate of 1890 was the highest on record, and was made up of extremes, varying from 18·2 in Ganjam to 43·6 in Madras district. The low birth-rate in Ganjam district was attributed partly to the effects of the distress which prevailed in 1889, and partly to defective registration. In three districts the birth-rate was above 40 per 1,000 (the assumed standard), in 11 it was between 30 and 40 per 1,000, and in the remaining seven districts it was under 30 per 1,000. With the exception of the Nilgiris, all the districts recorded more births than deaths, the excess ranging from 16·3 per 1,000 in Chingleput to 0·9 in Madras.

The number of deaths registered during the year was 650,394 or 22·80 per 1,000 against 661,178 or 23·57 in 1889, the decrease being mainly due to the diminished prevalence of cholera. As usual, the mortality among infants under one year of age was very high, amounting to 22·2 per cent. of the total deaths. Excluding Madras, where the mortality (42·7 per 1,000) was again higher than in any other district, the recorded death-rates ranged from 13·4 in Ganjam to 29·7 in Kurnool. The high death-rate in Madras district, the Governor in Council states, "is partly, no doubt, " due to more efficient registration, but it is clear that the extremely insanitary " condition of the town is also to a large extent the cause of the high mortality " returned. It is hoped that the extensive improvements in the water-supply and " drainage of the city, now under contemplation, will in the course of a few years, " effect a change for the better, but the hearty co-operation of the municipal authorities " in carrying out sanitary reforms is essential to the production of any marked " results."

There was a marked decrease in the mortality from cholera as compared with the previous year, the number of deaths having fallen from 76,020 or 2·71 per 1,000 to 35,288, or 1·23. Of the 22 districts in the Presidency, Bellary, Godavari, and South Canara were exempt from the disease, and in three others the mortality was trifling. The southern districts of Tinnevelly, Madura, and Tanjore, with death-rates of 3·4, 3·1, and 2·6 respectively, were the principal sufferers. Notwithstanding that cholera was so widely diffused in the Presidency, only 4,197 villages out of a total of 44,449 returned deaths. Of the 77 towns, no deaths from the disease were reported in 31. In Palni town, in Madura district, the cholera death-rate reached 28·8 per 1,000; the mortality was also exceptionally high in Calicut (21·4) and Vaniyambadi (15·0), but the

sanitary condition of these towns has frequently been reported to be bad, and the Governor hopes that early steps will now be taken to remedy the defects.

From small-pox 28,092 deaths were registered, being in the ratio of 1·03 per 1,000 of population, a less number than in 1889 by 1,046. Of this mortality, children under 12 years of age contributed over two-thirds, a fact which the Local Government has commended to the attention of all local authorities, as evincing the great importance of insisting upon infantile vaccination. Deaths from small-pox were registered in all the districts, but the mortality was heaviest in South Arcot, which recorded a death-rate of 4·5 per 1,000; South Arcot came next with a ratio of 1·9 per 1,000, followed by Kistna, Cuddapah, and Bellary-Anantapur, with ratios varying from 1·2 to 1·0 per 1,000.

The deaths registered under fevers rose from 230,172 or 8·23 per 1,000 in 1889 to 262,855 or 9·21. The increase was very general, all the districts except Ganjam and Vizagapatam contributing to it, and was almost entirely accounted for by the increased mortality during the second quarter of the year, which was attributed to the influenza epidemic then prevailing. But the Sanitary Commissioner, Surgeon-Major Laing, doubts whether the whole of the deaths recorded under fevers are really due to them in the medical acceptation of the term. Fever mortality continued excessively high in the towns of Cuddapah (21·5), Coonoor (16·3), and Kurnool (15·4). "In Kurnool and Cuddapah," it is stated, "the excessive dampness of the subsoil, due to imperfect "sanitary arrangements, accounts in a large measure for these results, and in Coonoor "the contaminated state of the existing water-supply is said to be the proximate "cause. Measures have been taken in all these towns to remedy the defects pointed "out, but until the projects contemplated have been completed, it is to be feared that "the present high death-rates must continue."

From bowel complaints 26,608 persons are reported to have died, being in the ratio of 0·93 per 1,000 against 29,122 or 1·06 in 1889. For some years the death-rate under this head has varied but very little, while the district ratios have shown great variations. In the year under notice the latter ranged from 6·7 per 1,000 in Madras to 0·2 in Vizagapatam.

Bombay.

The vital statistics of Bombay for 1890 show not only an improvement in registration, but also that the year was much healthier than the previous one. In the number of registered births there was a considerable increase, and there was a great diminution in mortality. The births registered during 1890 amounted to 641,115 or 38·97 per 1,000 of population, an increase of 40,626 or 2·48 on the number of 1889, which was contributed to by 20 out of the 24 collectorates. The city of Bombay recorded the lowest birth-rate (19·79), and Sholapur the highest (53·94). The registered deaths fell from 518,562 or 31·51 per 1,000 in 1889 to 463,616 or 28·18, the decrease being general, only six collectorates having recorded a higher death-rate than in the previous year. In the three collectorates of Bombay, Broach, and Ahmedabad the death-rate exceeded the birth-rate, the deficiency in the first of these of nearly 6 per 1,000 being attributed partly to defective registration. The Local Government hope that when Circle Inspectors are appointed throughout the Presidency, and systematic tests taken by them, the results of registration will improve considerably. Of the total deaths, 42·77 per cent. were of children under five years of age.

From all the principal diseases the mortality was lower than in 1889, but especially from cholera, the deaths from which numbered only 3,259 or 0·20 per 1,000 against 32,431 or 1·97. Six collectorates were exempt from the disease, and the others with the exception of Belgaum, Satara, and Karachi were only slightly affected. In the previous year, 14 collectorates recorded cholera death-rates exceeding 1 per 1,000, but in 1890 this ratio was not reached by any collectorate, and in only three of the 56 town circles was the mortality above this ratio.

From small-pox the deaths declined from 7,066 or 0·43 to 2,877 or 0·17. Of these 24·19 per cent. occurred among infants under one year of age, and 52·97 among children between the age of one and twelve. No district was entirely free from this disease. The Sanitary Commissioner, Dr. Macrury, gives a statement showing the annual deaths from small-pox since 1879, and dividing this period of 12 years it appears that the mortality has diminished very materially in the latter half as compared with the first six years, for while in the years 1879–84 the deaths numbered 32,107, in the years 1884–90 they aggregated only 20,835. There seems to be little doubt that this improvement is due to vaccination, which is attended with very satisfactory results in Bombay Presidency.

There was a decrease in the deaths ascribed to fever of 1,981. The number registered in 1890 being 344,897 or 20·96 per 1,000 against 346,878 or 21·08 in 1889. In just a half of the 24 collectorates the fever death-rate was higher than in 1890. Ahmedabad suffered most, with a ratio of 34·91, followed by Broach with 33·78, and Kaira with 30·37; in 10 other collectorates the Presidency ratio was exceeded. The earlier months of the year were the most fatal, especially April, when 42,786 fever deaths were recorded, exceeding the number in the same month of the previous year by 12,304. A certain proportion of this mortality, Dr. Macrury states, may be attributed to influenza.

Dysentery and diarrhœa caused 36,037 deaths, equal to 2·19 per 1,000 against 48,202 or 2·93 in 1889. The Presidency ratio was exceeded in seven collectorates, Belgaum, Dharwar, Bijapur, and Khandesh being the chief sufferers, with mortality ratios of 6·99, 5·65, 4·92, and 3·87 respectively. But excepting in Ratnagiri, Kanara, and Upper Sind Frontier, all the collectorates recorded lower death-rates under this head than in 1889.

In the Hyderabad Assigned Districts or Berar as the province is commonly called, the results of registration of vital statistics in 1890 indicate satisfactory progress. There were 111,450 births registered during the year, being in the ratio of 42·5 per 1,000 of population against 103,780 or 39·6 in 1889. The district ratios ranged from 40 and 41 per 1,000 in Wun and Ellichpur to 43·7 and 46·9 in Amraoti and Buldana. In towns the mean birth-rate was 38·8 per 1,000, and in rural areas it was 43·1. The Sanitary Commissioner, Dr. Little, attributes this difference to the greater difficulty of ascertaining births in towns than in villages "where the smallest event cannot "happen without the cognizance of the village officials."

The year was comparatively healthy, and the deaths, which aggregated 93,020 or 35·4 per 1,000, were fewer by 18,430 or 7 per 1,000 than the number registered in 1889. The decrease was common to all the districts, the death-rates of which ranged between 29·8 and 40·9 per 1,000. As usual the mortality was high among children, nearly a fourth of the total deaths having occurred among infants under one year of age.

The province was singularly free from cholera, and for the first seven months of the year the disease was entirely absent. There were only 847 deaths recorded from it against 10,925 or 4·2 per 1,000 in 1889. The disease, however, was widely spread, five out of the six districts having been affected. During the 23 years that registration has been established in this province, there have been striking contrasts in the mortality from cholera. In 1873 not a single fatal case was recorded, and in 1874 only two deaths were recorded, while in 1875 the number was 22,465 and in 1878 the maximum of 34,306 was reached. Intensity of cholera prevalence, Dr. Little points out, is generally attributed to insanitation, predisposition, and climatic causes. "Local insanitary conditions," he says, "are present more or less in every native "village, but these conditions are equally prevalent whether in years of maximum "or minimum intensity." The Army Sanitary Commission remark: "Although this "may be, and probably is quite true, the local conditions are none the less important, "and they are, moreover, the only disease causes with which the Health Officer can "deal. Atmospheric conditions, however intimate their relation with epidemics may "be, are beyond control; predisposition is a matter for the individual rather than the "State, but local insanitary conditions are a constant source of danger which the "Health Department can do much to remove."

The province enjoyed comparative exemption from small-pox, the deaths from it numbering only 324 against 1,737 in 1889. Of this mortality 88 per cent. occurred among children under 12 years of age. An interesting statement is furnished by Dr. Little in his report, proving the utility of vaccination in checking the disease. Beginning with 1868, when registration was first introduced into Berar, he divides the years into five-year periods. In the first of these, the small-pox deaths were in the ratio of 2·02, and the successful vaccinations 8·92 per 1,000 of population, and for the second five-year period (1873–77) the corresponding figures were 1·56 and 25·72. Since then the mortality has decreased to 0·10, and the protection has increased to 36 per 1,000.

Deaths registered under fevers rose from 47,104 or 17·9 per 1,000 in 1889 to 47,894 or 18·2, a ratio which has been exceeded only twice (1878 and 1883) since registration was commenced in the province. Wun as usual headed the districts with a fever death-rate of 22·2 per 1,000, and Basim recorded the lowest ratio, 12·3. Dr. Little attributes the high fever mortality of Wun district to its topographical conditions, "there being much more uncultivated jungle in this than in any of the other districts."

But as in other parts of India classification of diseases under this head is very imperfect, and Dr. Little reckons that the recorded deaths from fevers should probably be reduced 20 per cent. to bring them anywhere near the truth.

From dysentery and diarrhœa 13,328 deaths were registered, giving a ratio of 5·1 per 1,000 as compared with 17,395 or 6·6 in 1889. But as with fevers, a very large number of deaths attributed to dysentery and diarrhœa are wrongly classified. "Dysen-"tery in the acute form," Dr. Little says, "is a disease very rarely met in the province, "and those deaths due to bowel complaints are chiefly cases of diarrhœa occurring in "the very old and young."

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IV.—JAILS.

Sickness and mortality in 1890.

There was more sickness among the jail population of India during 1890 than in the previous year, the ratio of admissions into hospital per 1,000 of average strength having risen from 1,041 to 1,142, and the daily average sick-rate from 35 to 36. The death-rate, however, was considerably lower, viz., 30·68 against 35·63 per 1,000. The decrease was spread over six out of the ten provinces, and in the remaining four the increase was very trifling. The most noticeable improvement was in the Bengal jails, where the admissions, daily sick and death-rates were all much lower than in 1889. The decrease in mortality was mainly due to the diminished prevalence of cholera. From this disease the deaths fell from 489 or 5·70 per 1,000 to 146 or 1·63. Dysentery and diarrhœa were also slightly less fatal, while deaths from fevers increased from 214 to 238. The jails of the Central Provinces, Berar, and Coorg were free from cholera, and only in the North-Western Provinces, and Oudh was there an increase in mortality under this head.

The following statement shows the sickness and mortality among all classes of prisoners in the jails and subsidiary jails of the several provinces for 1890, as compared with the previous year:—

Provinces.	1890.			1889.		
	Ratio per 1,000 of Average Strength.			Ratio per 1,000 of Average Strength.		
	Admissions.	Daily Sick.	Deaths.	Admissions.	Daily Sick.	Deaths.
Bengal	1,251	39	32·27	1,304	46	45·78
North-Western Provinces and Oudh	900	36	33·54	786	31	28·03
Punjab	1,937	47	31·23	1,682	37	29·27
Burma	1,002	38	26·56	972	41	48·98
Central Provinces	1,017	31	26·06	946	27	51·61
Assam	1,987	56	36·29	1,977	62	45·64
Coorg	2,295	63	30·96	1,760	50	29·82
Madras	731	24	23·85	646	25	38·53
Bombay	827	27	31·98	718	23	31·30
Berar	678	21	18·17	629	14	20·46
India	1,142	36	30·68	1,041	35	35·63

Bengal.

The returns of the Bengal jails for 1890 show a considerable improvement in the health of the prisoners. The rate of admissions into hospital fell from 1,304 per 1,000 of average strength to 1,251, the daily sick-rate from 46 to 39, and the death-rate from 45·78 to 32·27. Of the total 477 deaths, 447 were of convicts, equal to a death-rate of 33·2 per 1,000 of average strength against 626 or 46·0 in 1889. The death-rate of 1890 was the lowest on record. "In future," it is stated, "whenever there have "been three deaths, and a death-rate exceeding 60 per 1,000 in any jail in a year, a "special examination is to be made by a committee, in order to ascertain the cause "of the mortality." Twenty-nine jails in the province showed a decrease in the mortality, and out of 14 jails in which the death-rate was higher than in the previous year the deaths exceeded 50 per 1,000 in five only.

Among the principal diseases causing death, dysentery and diarrhœa came first with 148 deaths, nearly a third of the total mortality, respiratory diseases followed with 82 deaths, anæmia and general debility with 32, cholera with 31, and scrofula and phthisis pulmonalis with 27. The following jails recorded the highest mortality during the year: Shahabad (148·4), Julpigoree (114·0), Rungpore (86·8), Dinagepore (71·7), and Sarun (65·8). In the Shahabad and Sarun jails the large number of deaths was almost entirely due to cholera, no less than 17 out of a total mortality of 19 having been caused by this disease in the former jail, and 7 out of 14 in the latter. Of the 8 deaths among convicts in the Julpigoree Jail, 5 had been admitted

in indifferent health and 3 in bad health. A similar explanation is given for Rungpore and Dinagepore, though the high mortality was more or less attributable to the unhealthiness of the jails themselves. In three jails out of 45 there were no deaths among the convicts, and in 23 the rate of mortality was below the average of the province. There was a slight improvement in the health of the prisoners discharged as compared with the previous year. Of the convicts discharged during 1890, 20·8 per cent. lost weight in jail against 19·6 in 1889 and 20·6 in 1888. Great attention was paid to the subject of the water-supply of the jails during the year, and no expense was spared to get the best water available. In the matter of conservancy, the Inspector-General reports: "The dry earth system is rigidly carried out "in every jail. Mr. P. Donaldson has successfully worked his invention of a night-"soil ejector in the Presidency Jail for some months of the past year. This invention "is a complete success. Besides doing away with the nuisance of carrying the night-"soil out through the main gate, it has, by restricting the passage of sweepers "outside, lessened the opportunities for introducing forbidden articles. It has, "further, the very great advantage of pugging the night-soil and the dry earth "together as they are passed out, and thus making the poudrette more suitable for "garden manure." This invention has the approval of the Governor-General of India, who has brought it to the notice of Local Governments and Administrations for introduction into jails in other provinces.

North-Western Provinces and Oudh.

The year 1890 being an exceptionally unhealthy one in the North-Western Provinces and Oudh accounted for the increase of sickness and mortality in the jail population. The admissions into hospital per 1,000 of average strength rose from 786 in 1889 to 990, the daily sick-rate from 31 to 36, and the death-rate from 28·03 to 33·54. Cholera was the chief cause of the rise in mortality, the deaths from the disease among all classes of prisoners being 58 (equal to 2·27 per 1,000), or 14 more than in the previous year. But only four jails were visited by the disease, the chief sufferer being Lucknow Central Prison, where 53 of the total 58 cholera deaths took place. During the greater part of the year the health of the prisoners in this jail was remarkably good, but in August an epidemic of cholera of a virulent and widespread type broke out, when the prisoners were at once moved into camp. The Sanitary Commissioner of the Provinces visited the jail and reported on the outbreak, and a project for the more satisfactory drainage of the jail was receiving the attention of the Chief Engineer. There was also a considerable rise in the mortality from dysentery, diarrhœa, and respiratory diseases. Among the convicts the deaths were in the ratio of 33·62 per 1,000 against 28·03 in 1889. Of the 51 jails in the united provinces 33 recorded higher death-rates than in 1889, and in 25 jails the mortality was above the provincial average, ranging between 35·34 and 104·04 per 1,000. Gorakhpur Jail, where the mortality was very high (92·49 per 1,000), has been unhealthy for some time past, and as attempts to improve it have failed, the Local Government issued final instructions for the construction of a new jail on some healthy site away from the town. Of the 50,713 prisoners who were discharged from jail during the year, 28,038 gained weight, 13,326 lost weight, and 9,349 neither gained nor lost weight.

Punjab.

Notwithstanding that the year 1890 in the Punjab was the most unhealthy since vital statistics were first recorded, and that the death-rate among the free population was more than 15 per 1,000 higher than in either of the two previous years, the death-rate in the prisons but slightly exceeded that of 1888 and 1889. There was, however, a considerable increase of sickness among the prisoners in 1890, the admissions into hospital and daily sick being 1,937 and 47 per 1,000 of average strength against 1,682 and 37 respectively in 1889. The deaths from all causes were in the ratio of 31·23 per 1,000 against 29·27. The results of the year under review, the Lieutenant-Governor observes, "are therefore very creditable to the superintendents "of the jails as a body, and to the subordinate medical officers working under them." In a great measure the increase in the admission-rate was due to the additional care bestowed on the health of the prisoners, and to the more ready admission into hospital before sickness had had time effectually to seize them. As regards the mortality the Inspector-General remarks: "In considering the relative death-rates "of the prison and the free population, it must be borne in mind that a large "proportion of the prisoners are admitted to jail in a more or less broken-down state "of health, and that their being so is, beyond all question, a most powerful cause of "the high death-rate that characterises our prisons as compared with those in "England." In nine jails the death-rate was less than 16 per 1,000, and in one (Simla) there were no deaths at all; while in 12 the mortality exceeded the provincial

average, the highest ratio, 69·3, being recorded in the Dharmsala Jail. Although cholera was epidemic in 17 or 18 districts of the province, there were only six cases in the jails, five of which were fatal; on the other hand, there was a considerable increase in the mortality under dysentery and diarrhœa. Of the 388 deaths, 149 were from pneumonia, and the increasing prevalence and persistence of this disease call, the Government of India remark in their orders on the jail reports, for special inquiry. The high rate of mortality in the Dharmsala jail was the result of seven deaths among an average strength of 105, and was attributed to a great extent to the unhealthiness of the locality and the poor state of health of prisoners on admission, but there were also certain sanitary defects in the jail requiring attention. The purity of the water-supply was doubtful, and measures for improving it were under consideration. The next most unhealthy jail was Delhi, with a death-rate of 62·06 per 1,000. Here, too, the purity of the water was impugned; but it is pointed out that if the water were bad, more deaths would in all probability have occurred from some form of bowel disease, whereas 20 out of the total 35 deaths resulted from pneumonia. The death-rate at the Lahore Central Jail was 51·02 per 1,000, or slightly in excess of the ratio of the previous year. Since the year under notice this jail has been furnished with a new water-supply, which will, it is hoped, be of real benefit to the health of the prisoners. In the Jhelum, Gujranwala, and Sialkot Jails also the mortality was high, viz., 50·98, 49·14, and 44·08 per 1,000 respectively, and was attributed to the severe epidemic of malarial fever which prevailed during the autumnal months over the districts of the same names.

Of the total 388 deaths, 376 were of convicts, being in the ratio of 31·89 per 1,000 of average strength against 29·92 in 1889. Among convicts of less than six months imprisonment the death-rate rose from 26·24 per 1,000 in 1889 to 29·29, among those who had been in jail between six and 12 months there was a slight decrease, while among prisoners who had been in confinement from one to two years, there was a considerable increase in the proportion of deaths; but the greatest increase occurred among convicts who had been in jail over seven years, the death-rate being 64·52, or 11 per 1,000 greater than that of 1889.

Burma.

The health of the prisoners in Burma during 1890 was considerably better than in the previous year. For the whole province the admissions into hospital were in the ratio of 1,002 per 1,000 of average strength, the ratio of daily average sick was 38, and the death-rate was 26·56, against a mortality in 1889 of 48·98 per 1,000. The ratios of admissions to hospital and of daily average sick were more favourable in the Upper than in the Lower Burma jails, and owing to their greater immunity from fever of a remittent, or continued type, and cholera, the death-rate in the former (27·39) was likewise more favourable than that (28·53) in the latter. Altogether there were 29 cases of cholera with 19 deaths against 147 cases and 93 deaths in 1889. All but one of the 19 deaths occurred in Lower Burma, the great majority (13) having occurred in the Rangoon jail. From fevers there were 35 deaths in the jails of the province, and from bowel complaints 108 deaths. During the year the question of the water-supply of the jails received attention, and the results of the various analyses were satisfactory, except in the case of Toungoo, where the wells had become contaminated with sewage, and water had to be brought from the River Sittang. The Chief Commissioner requested the Inspector-General of Jails to ascertain how the Toungoo water-supply could best be improved, and how it came to be contaminated.

Central Provinces.

Although the admission and daily sick-rates of the jails in the Central Provinces for 1890 were higher than those of the preceding year, there was a material reduction in the mortality. The ratio of admissions into hospital per 1,000 of average strength rose from 946 to 1,017, the daily sick-rate from 27 to 31, while the death-rate declined from 51·61 to 26·06. The increased sick-rate was due to the poor state of health of many of the prisoners on admission to jail, and to the prevalence of influenza; and the decrease in mortality was due to the total absence of cholera, the diminished prevalence of bowel complaints, and to the generally mild character of the sickness in jail. In the previous year there were 69 deaths from cholera, and 67 from dysentery and diarrhœa, the latter being almost double the mortality (37) of 1890. Of the three central jails of the province, with an average strength of over 500, there was a considerable increase of sickness in the Nagpur Jail, where the admissions from respiratory diseases rose from 59 to 352, but, owing chiefly to freedom from cholera, deaths in this jail fell from 39 to 16. In the Jubbulpore Jail the general health of the prisoners, the medical officer reported, was better than it had been for 26 years,

and the mortality (13·38) was the lowest on record. The Raipur Jail suffered from influenza, which accounted for the increase in the number of admissions to hospital from 366 to 407. The most unhealthy jail in the province was Damoh, where among an average convict strength of 88 the admissions rose from 23 in 1889 to 52, and the deaths from 6 to 13, the death-rate for 1890 being 148·15 per 1,000.

Assam.

The health of the convict population of Assam in 1890 was, on the whole, better than in the previous year. The admissions to hospital were nearly in the same ratio, viz., 1,987 per 1,000 of average strength against 1,977, but the decrease in the daily average sick-rate from 62 to 56 per 1,000 shows that the sickness was of a milder type than that of 1889. The deaths numbered 51, all of which occurred among the convicts, the ratio being 36·29 per 1,000, against 70 deaths or 45·64 in the preceding year. Only five out of the nine district jails, however, shared in this decrease, and at Dibrugarh there was a marked increase in mortality. Of the total 51 deaths, 4 were due to cholera, 11 to respiratory diseases, and 15 to dysentery and diarrhœa. Considerable improvements were effected during the year in the sanitary arrangements of the jails, which the Inspector-General of Jails had no doubt accounted in some degree for the smaller death-rate, as the year generally was not a healthy one in the province. He reports that "effect was fully given to the suggestion of the Jail Committee in the matter of "special gangs of prisoners, and, besides the sick under treatment, a convalescent "and infirm gang of persons unfit for ordinary labour was formed in each of the "jails, and also a special gang of persons suffering temporarily or permanently from "obscure functional or organic diseases, or from malnutrition. These gangs were "under the special care and observation of the medical officers. This segregation "has undoubtedly acted beneficially in improving the health of these prisoners."

Madras.

Owing to the prevalence of influenza and other epidemics in the Madras Presidency, during 1890, the number of admissions to hospital among the prisoners was larger than in the previous year, the ratio per 1,000 of average strength being 731 against 646. Out of 6,152 admissions into hospital in central and district jails, 1,052 were treated for influenza. The mortality, however, compares favourably with that of 1889, the total deaths having declined from 325 or 38·53 per 1,000 to 213 or 23·85, showing that the general health of the prisoners was on the whole satisfactory in 1890. Out of the 213 deaths that occurred, 22 were from cholera, 11 of which occurred in Berhampore District Jail, and 6 in the Penitentiary, Madras. But of all diseases dysentery and diarrhœa were again by far the most fatal, the deaths from them numbering 64. The most unhealthy jail was Berhampore, which returned a death-rate of 91·49 per 1,000. Next came Mangalore, Parvatipur, Calicut, and Trichinopoly, with respective death-rates of 65·37, 59·14, 49·29, and 40·28. There were no deaths in Nellore Jail, the European Prison at Ootacamund, and the Debtors' Prison, Madras.

Among the convict class there were 191 deaths, being in the ratio of 24·01 per 1,000 against 38·28 in 1889, and of these 88 took place among prisoners during their first six months of imprisonment.

Bombay.

The health of the jails in the Bombay Presidency in 1890 was less favourable than in the previous year. The rate of admissions into hospital rose from 718 per 1,000 of average strength to 827, the daily sick-rate from 23 to 27, and the death-rate from 31·30 to 31·98. Under a majority of the classes of disease there was an increase both in the admissions and deaths, but especially under respiratory diseases, the admissions from which rose from 448 to 576, and the deaths from 51 to 72. The admissions from dysentery and diarrhœa (729) were fewer by 36 than in 1889, but the mortality was greater, 58 deaths having been recorded, or 6 more than in 1889. On the other hand, there was a satisfactory decrease in admissions and deaths from cholera. The disease appeared only in the Ahmedabad Jail and subordinate jails; the former returned 8 cases out of 9, and 4 deaths out of 5. In the previous year there were 44 cholera cases with 25 deaths. The jails showing the highest death-rates were Kaira (73·2), Shikarpur (64·5), Ahmedabad (51·9), Hyderabad (50·7), the Deccan Gang (42·2), and Nara Gang (49·5), Thana (34·4), and Karachi (33·1). In four jails there were no deaths during the year, and in seven the death-rate was below 20 per 1,000. It was, therefore, only in the above eight jails that the mortality appears to have been exceptional, and most of these, the Inspector-General observes, have frequently, in previous years, contributed largely to the death-rate of the year.

Among the convict class there were 230 deaths, equal to 33·7 per 1,000 of average strength against 219 or 32·4 in 1889, and of these more than a half (127) had been less than six months in jail. The number of prisoners discharged during the year was

15,356, of whom 16·8 per cent. neither lost nor gained weight, 52·2 per cent. gained, and 31 per cent. lost weight, results which were not quite so satisfactory as in 1889.

Berar.

In Berar the health of the prison population was satisfactory. The admission-rate rose from 629 per 1,000 of average strength in 1889 to 678, and the daily sick-rate, from 14 to 21 per 1,000, the increase being attributed to the influenza epidemic which prevailed in March and April, its prostrating effects having kept those admitted with it some time in hospital. The total number of deaths was 18, of which three were due to pneumonia and two to influenza. The jails were free from cholera, and there was no over-crowding anywhere. All the deaths but two occurred among the convicts. Eight of the 18 deaths (including the two from influenza) took place in the Akola Jail, and in two of the seven jails there were no deaths.

V.—VACCINATION.

During 1890–91 there were 5,974,598 persons successfully vaccinated in the several provinces of India, being an increase of 165,136 on the number operated on in the previous year. According to age, over 2¼ millions of the total were of children under one year of age, and nearly 2¾ millions were of children between the ages of one and six years. The proportion of population protected was equal to 28·90 per 1,000, which was made up of ratios ranging from 40·18 in Coorg to 19·48 in the North-Western Provinces and Oudh and 10·57 in Upper Burma. The proportion was greater in five and less in five provinces than in 1889–90. In the vaccination of infants the best results were obtained from Berar, where 82½ per cent. of the children born during the year (estimated at 40 per 1,000) were protected against small-pox. Bombay Presidency came next with a percentage of success of 60, followed by the Punjab with 57 and the Central Provinces with 53 per cent. General results.

On the whole, slight progress was made in vaccination work in Bengal during 1890–91, the total number of persons vaccinated having increased from 1,805,470 in the previous year to 1,833,978. The increase, however, was confined to the three circles of Darjiling, Orissa, and Behar, the remaining four circles and municipalities having shown a decrease. In the Calcutta circle there was a falling off of 8,782 operations compared with 1889-90, which was reported to be due to the unusually large number of vaccinations (26,280) performed during the small-pox epidemic of the previous year, and which left fewer subjects to be operated on during the year under notice. The Eastern Bengal Circle accounted for the large decrease of 70,110 operations, and the Metropolitan Circle of 28,965. The bad results of the former of these two circles were due to a decrease of 103,507 operations in the Chittagong District, which was attributed to the vaccinators having had to work in the same areas previously gone over by them. Statistics show that there has been a progressive falling off in this district for three years, and that the close of the last (1890–91) was marked by a serious outbreak of small-pox in the town of Chittagong, in the course of which it became apparent that the people regarded vaccination with considerable distrust. Inquiry into the recent management of vaccination in the town showed that out of 547 persons vaccinated during 1887–88 within municipal limits, under the immediate supervision of the Civil Surgeon, as many as 331 or 60·5 per cent. had been attacked by small-pox; in 1888–89 the proportion of attacked among those who had been vaccinated was 39·1; in the next year 31·5, and it was only in 1890–91, when the outbreak had drawn attention to the subject, that the proportion fell to 6·5 per cent. The Lieutenant-Governor, in his orders on the vaccination report, remarks:—
"When vaccination carried on in a limited area, with exceptional facilities for "constant supervision, was found to yield such defective results, it becomes difficult "to believe in the accuracy of the returns of successful operations in areas where no "thorough check can be applied. It is clear that in many parts of Bengal the people "have a strong prejudice against the lymph that is used for vaccination, and until this "prejudice is removed by fuller experience of the benefits of vaccination, no real and "continuous progress can be looked for. Distrust of the lymph seems to be the main "cause which hinders the expansion of the operations of the Department, and the "efforts of the Sanitary Commissioner should now be directed to the production of "lymph of a sound and uniform character." Of the total number of operations 1,816,258 were primary cases, of which 99·25 per cent. were successful, a ratio which, as the Army Sanitary Commission observe, seems hardly credible. According to age, 290,779 of the successful primary vaccinations were of children under one year and 1,305,259 were of children between one and six years old. For the whole province the persons successfully vaccinated per 1,000 of population were in the ratio of 28·64. At the close of the year the Compulsory Vaccination Act was in force in all the towns except eight; it was also extended during the year to the rural areas in the district of Rungpur, and to portions of the Sonthal Pergunnahs, Tipperah and Bhagulpur districts. Bengal.

The vaccination returns of the Punjab for 1890–91 show a decrease of 83,968 cases compared with the previous year, the total number of persons vaccinated having fallen from 934,110 to 850,142. This was entirely due to the comparatively small amount of work done in Kangra district, where, owing to exceptional circumstances, Punjab.

there was an abnormal increase in the two previous years. In 1888–89 the vaccinations in this district numbered 240,784; in 1889–90, 183,691; and in the year under notice the number declined to 20,413. Excluding the figures for the Kangra district, there was a net increase of 79,310 cases as compared with the previous year. The passive resistance, Surgeon Major Stephen says, which people in a good many places show towards vaccination is slowly but gradually diminishing. Of the total number of operations performed, 595,134 were primary vaccinations, of which 94·95 per cent. were successful. Children born during the year were protected from small-pox to the number of 431,783, equal to 58 per cent. of the registered births, and of children between one and six years of age 121,221 were protected. The number of persons protected from small-pox per 1,000 of population was 37·15 against 40·13 during 1889–90. Vaccination with animal lymph was carried out during the year with most satisfactory results. There were 581,664 operations, against 246,105 in 1889–90, the great majority (575,636) being from buffalo lymph, or an increase of 335,559. "This large increase," the Sanitary Commissioner remarks, "shows that the method "of animal lymph vaccination is becoming more popular in the province, and I "believe that in a few years it will entirely take the place of the arm-to-arm method." Under the orders of the Government of India experiments with animal lymph preserved in lanolin were conducted during the year at Amritsar and Peshawar with fair success; but the general introduction of the system was deprecated for the present owing to the expense involved, and to the already existing prejudices against animal lymph even without any admixture. In the larger Native States of the Punjab which have their own establishments, vaccination was prosecuted with fair vigour in 1890–91.

North-Western Provinces and Oudh.

Good progress was made in vaccination work in the North-Western Provinces and Oudh during 1890–91, the total number of persons vaccinated being 989,169 or 188,412 more than in the previous year. The increase extended to every district except five, and in these the falling off was inconsiderable. Although in some of the districts of Oudh the record is still very backward, it is satisfactory to notice that every district showed an increase in work compared with the previous year. The Sanitary Commissioner states that the Deputy Commissioner of Lucknow "is of "opinion that all direct opposition to vaccination within his jurisdiction has almost "altogether disappeared, and that it will soon be possible to extend the operation to "every child in the Lucknow district. The only need is an abundant supply of pure "animal lymph to enable operations to be carried on on a large scale whenever "necessary, and when the supply of humanised lymph is restricted by the prejudice "of the people against the use of their children as vaccinifers." Primary operations numbered 948,626, and of these 92·96 per cent. were successful. Among children under one year of age the successful primary operations rose from 323,922 in 1889–90 to 386,293, and among children over one and under six years of age from 335,856. to 388,703. That there is still room for improvement is shown by the fact that only 19·48 persons per 1,000 of the population were successfully vaccinated during the year, but this is an improvement of 3·39 on the proportion of 1889–90; the number of children under one year of age (386,293) protected, compared with the registered births of the year (1,751,186), also witnesses to the large number of persons unprotected from small-pox being added annually to the population. In consequence of the action taken by the Local Government in drawing the attention of the municipalities to the advantages of the Vaccination Act, 59 municipalities applied for the extension of the Act, and it was brought into force in 42.

Burma.

The total number of vaccine operations performed in Lower Burma in 1890–91 was 143,255, being 18,303 in excess of the number of the previous year. The increase, however, was not general, as in four districts there was a considerable falling off in the vaccinations, viz., in Toungoo from 8,905 to 4,351, Sandoway from 4,249 to 2,806, Henzada from 10,134 to 8,298, and Salween from 2,166 to 1,106. Of the districts showing an increase, Hanthawaddy headed the list with 10,566, Amherst following with 5,663, Prome with 3,950, Akyab with 3,836, and Shwegyin with 1,344. The persons primarily vaccinated numbered 104,183, with a percentage of success of 85, which was much below that of other provinces. Of the total 88,650 successful primary vaccinations, 19,641 were of children under one year of age, and 50,119 were of children between the ages of one and six years. During the year the Vaccination Act was extended to four municipal towns, among them being Prome, where, although in 1888 the opposition was so great as to prevent the extension of the Act, the motion to apply to the Local Government was carried in the Municipal Committee by seven to five.

In Upper Burma 42,912 vaccine operations were performed in 1890-91, being an increase of 9,671 on the number of the previous year. The increase might have been larger but for the inferior character of the vaccinating agency in some districts. Primary cases numbered 41,732, and of these 34,518 or 82·47 per cent. were successful. At the close of the year the Vaccination Act was extended to Upper Burma; its application to the town of Mandalay has since been proposed, and its introduction into other towns and cantonments was under consideration.

Central Provinces.

The vaccination returns of the Central Provinces for 1890–91 show a considerable increase of operations compared with the results of the previous year. The total number of persons vaccinated was 457,678 against 411,276 in 1889–90. In the latter year, however, the figures for Patna State were not embodied; deducting these (6,008) from the figures of 1890–91 for the sake of comparison, the result gives an increase of 40,394 operations over those of 1889–90. Of the total vaccinations, 409,026 were primary cases, and of these 96·39 per cent. were successful. Primary vaccinations were more numerous in 13 out of the 18 districts of the province, those in which the most marked increase took place being Raipur, Sambalpur, Bilaspur, Nagpur, and Bhandara. During the year 231,848 children under one year old were successfully vaccinated, and 141,292 children between the ages of one and six years. Estimating the births at 40 per 1,000 of population, 52·7 per cent. of the children born in 1890–91 were protected against small-pox; and the number of persons who were protected per 1,000 of the population was 37·94 or 3·07 more than in 1889–90. In accordance with instructions, steps were taken to effect the substitution of animal lymph for that obtained from human beings, and experiments made with a small quantity obtained from Berar proved successful enough to justify a proposal to start an animal lymph depôt at Pachmarhi.

Assam.

Steady progress continued to be made in vaccination work in Assam. During 1890–91, 187,110 persons were vaccinated, which is an increase of 41,454 on the number of the previous year. To this improvement every district contributed except Goalpara and the Garo Hills, in each of which there was a slight falling off. Sylhet district recorded the satisfactory increase of 15,999, and in the Darrang district the work done increased by 5,973 over the figures of 1889–90. On tea gardens there was also an increase of 31 per cent. in the number of vaccinations, following an increase of 40 per cent. in the previous year. The total number of primary operations performed was 177,356, of which 91·13 per cent. were successful. Exclusive of tea gardens, but including dispensary work, 16,183 of the 161,625 successful primary operations were of children under one year old, and 94,922 were of children between one and six years of age. Reckoning the births at 40 per 1,000 of population, only 7·5 per cent. were protected from small-pox. The increase in operations was accompanied by the satisfactory increase in inspections from 80,737 cases during 1889–90 to 98,612, with the result that 90·83 per cent. were found successful as compared with 91·93 in the previous year. In January 1890 a calf lymph depôt was established at Shillong to supply the province with animal lymph and the results of the experiment were reported as satisfactory. During the year vaccination in the Dhubri and Goalpara municipalities was made compulsory by the extension of the Vaccination Act. The Act has now been introduced into five municipal towns of the province.

Madras.

In the Madras Presidency there has been a steady improvement in vaccination work since 1886. In that year the number of vaccinations was 705,587, and it has since risen year by year to 960,560 in 1890–91, or 84,812 in excess of the number in 1889–90. Of the total operations, 906,119 were cases of primary vaccination with a percentage of success of 94·1. As regards the protection of the infantile population, only 14·8 per cent. of the children registered as born during the year, estimated at 40 per 1,000, were successfully vaccinated. The number of persons protected from small-pox per 1,000 of population was 27·9, which is a slight improvement on 26·1 the ratio of the previous year. The increase in vaccination work was spread over all the districts but six, and was attributed partly to an addition of 18 to the vaccination staff and partly to the larger average number of vaccinations performed per man. Of the total 55 municipal towns in the Presidency vaccination was compulsory in 38, having been introduced in 13 during the year under notice. Animal vaccination was carried on in 17 districts and 39 municipalities with the result of 257,426 operations, or considerably over a third of the year's work, with a percentage of success varying with the kind of lymph used, that from fresh lymph (calf-to-arm) yielding the best results, viz., 95·9. During the year, experiments were made in 12 districts with

lanolin vaccine. It was employed in 76,159 cases, exclusive of operations by medical subordinates, and yielded a percentage of success of 90 cases against 95·5 where fresh animal lymph was used in Local Fund circles.

Although there was an addition of three inspectors and 12 vaccinators to the working staff of the Bombay Presidency, the total number of persons vaccinated fell from 958,702 in 1889–90 to 931,747 in 1890–91, a decrease of 26,955 or 2·81 per cent. The decrease was attributed to sickness among some of the vaccinators, owing to the influenza epidemic, which was severely felt in the beginning of the year in most of the larger towns of the Southern Registration District, and to some extent to the vaccination staff being required to assist in the census operations. But in the opinion of the Local Government, this explanation did not satisfactorily account for the very considerable falling off in the results. There were 885,260 persons primarily vaccinated, and of these 95·10 per cent. were successful cases, being 0·22 per cent. more than in 1889–90. Estimating the births at 40 per 1,000 of population, 60·4 per cent. were successfully vaccinated, and of children between one and six years 206,756 were protected. Considerable progress was made during the year in the introduction of vaccination with animal lymph. It was in use throughout the year in Bombay and Poona, and was introduced temporarily in parts of the Thana district, in the town of Sholapur, in Dharwar, and in Hubli, and was re-introduced in Karachi. A class for the instruction of the subordinates of the Sanitary Department in practical vaccination was with the sanction of the Local Government opened during the year, when 47 members joined, and of these 8 were inspectors, 24 vaccinators, and 15 candidates.

There was a considerable increase in the number of vaccinations performed in Berar during 1890–91, the total having risen from 103,672 in the previous year to 114,162. Of these, 97,651 were primary cases with a percentage of success of 95·1, which was slightly lower than in the previous year (95·7). This was attributed to the substitution of calf lymph for arm-to-arm vaccination, and to the circumstance that many of the vaccinators had not acquired sufficient proficiency in animal vaccination. Of the total number of successful primary cases, 79,681 were of infants under one year of age, and 11,841 were children over one and under six years old. The percentage of infants successfully vaccinated (estimating the births at 40 per 1,000), was 82·5. The percentage of the population successfully vaccinated was 36·8 per 1,000, as compared with 35·4 for 1889–90. Bovine lymph was in use throughout the province, and since October of the year under notice it had been worked to the exclusion of arm-to-arm vaccination. The Sanitary Commissioner says "the people much prefer animal lymph; "they believe it to be more efficacious than humanized lymph, and that ulcerations less "frequently occur with its use than with the arm-to-arm method. Of the total "operations, 88,881 or 85·6 per cent. were performed with bovine lymph, and but 14·4 "per cent. with humanized lymph. The use of animal lymph direct from the cow has "much to commend it, and is beset with no difficulties in this province, so that in "future the department can dispense altogether with lymph obtained from the human "subjects."

VI.—MEDICAL INSTITUTIONS.

Civil Hospitals and Dispensaries.

The following comparative statement shows the number of hospitals and dispensaries open in the several provinces of India during 1889 and the previous year, and the number of patients under treatment:—

Provinces, &c.		Number of Institutions.	Number of In-door Patients.	Number of Out-door Patients.	Total Number of Patients.
Bengal	1890	265	29,660	1,239,850	1,269,510
	1889	255	28,981	1,179,843	1,208,824
Calcutta and Howrah	1890	7	24,362	208,073	232,435
	1889	7	24,330	207,837	232,167
North-Western Provinces and Oudh	1890	295*	52,566	2,837,803	2,890,369
	1889	279*	51,705	2,588,388	2,640,093
Punjab	1890	216	48,147	2,532,349	2,580,496
	1889	208	45,125	2,266,916	2,312,041
Burma	1890	74	23,125	339,088	362,213
	1889	72	20,214	299,426	319,640
Central Provinces	1890	107	7,885	867,219	875,104
	1889	104	8,156	840,087	848,243
Assam	1890	69	3,704	261,723	265,427
	1889	64	4,158	255,724	259,882
Coorg	1890	4	567	21,554	22,121
	1889	3	502	15,719	16,221
Madras	1890	415†	47,739	2,663,418	2,711,157
	1889	393	46,176	2,471,427	2,517,603
Bombay	1890	248	38,512	1,685,072	1,723,584
	1889	244	37,549	1,659,065	1,696,614
Berar	1890	44	3,075	274,195	277,270
	1889	44	2,773	270,439	273,212
Total	1890	1,744	279,342	12,930,344	13,209,686
	1889	1,673	269,669	12,054,871	12,324,540

* Statistics were furnished for only 250 in 1889 and for 271 in 1890.
† Statistics were furnished for only 406.

Bengal. The total number of dispensaries at work during 1890 in Bengal, exclusive of Calcutta, was 265, an increase of 10 on the number of the previous year. At these there were 1,269,510 patients under treatment, 29,660 being in-door, and 1,239,850 out-door patients, against 28,981 and 1,179,843 respectively in the previous year. This shows a total increase of 60,686, which was attributed partly to the opening of new dispensaries and partly to the increasing popularity of the institutions. Comparing these figures, however, with those of other provinces, it appears that while in the North-Western Provinces, 56·2 per 1,000 of the population, and 47·9 in Assam, resorted to the dispensaries for treatment, the proportion in Bengal was only 17·9 per 1,000. It cannot be supposed, the Inspector-General states, that the aversion of the people of Bengal to the European system of medical treatment is greater than it is in other parts of India, and probably the true explanation of the smaller attendance in Bengal is to be found in the inaccessibility of many of the dispensaries during the rains, the larger number of private practitioners at work among the people, the stricter application of the rules forbidding the grant of gratuitous advice and medicines to well-to-do patients, and the smaller amount of practical surgery to be found at the Bengal dispensaries when compared with that of other provinces. The Local Government think it probable that the number of private practitioners and

the preference of the people for the kabiraja over the regular surgeon were the chief causes. As already stated, the year 1890 was an unhealthy one in Bengal, and there was consequently a considerable increase in the number of patients treated for malarial fever; but, on the other hand, although more than 12,000 deaths were reported under small-pox, only 103 cases were attended to in the dispensaries. Among the in-door patients there were 3,814 deaths, being in the ratio of 125·5 per 1,000 of total treated, against a death-rate of 139 per 1,000 in 1889. During the year, 6,344 major operations were performed against 5,174 in 1889, and of these only 116 terminated fatally. Operations for cataract also increased from 896 to 1,686, with a percentage of success of 80·6 as compared with 68·89 in 1889. Attention is drawn by the Inspector-General to the excellent work done at Gya by Surgeon-Major R. D. Murray, who during nine months of the year performed 838 operations, of which 571 were for cataract. This good work resulted in an increase in the number of in-door patients from 718 to 1,313, and of out-door patients from 9,642 to 11,312, "showing that the people are ready enough to take advantage of European surgical treatment when it is brought within their reach."

The following statement shows the number of in-door and out-door patients treated in the several hospitals of Calcutta, including the Bhowanipore Dispensary, the statistics of which are for the first time shown in the report, the institution having been included within the limits of the Calcutta Municipality only during the last two years :—

Medical Institutions.	1890.				1889.			
	Total Treated.			Died per 1,000 of treated.	Total Treated.			Died per 1,000 of treated.
	In-door.	Out-door.	Total.		In-door.	Out-door.	Total.	
Medical College Hospital	6,741	52,108	58,849	92·68*	6,655	50,182	56,847	89·62*
Presidency General Hospital	3,105	—	3,105	86·07	3,190	—	3,190	89·81
Mayo Institutions	2,140	134,849	136,989	111·68	2,278	137,419	139,697	126·86
Campbell Hospital	6,415	—	6,415	203·97	8,253	—	8,253	205·95
Police Hospital	2,593	—	2,593	8·09	2,432	—	2,432	8·23
Bhowanipore Dispensary	—	10,694	10,694	—	—	10,627	10,627	—
Total Calcutta Hospitals	22,994	197,651	220,645	118·30*	23,817	196,228	221,045	119·91*
Howrah General Hospital	1,368	10,422	11,790	220·62	1,513	9,609	11,123	217·44
Grand Total	24,362	208,073	232,435	124·15*	24,330	207,837	232,167	126·13*

* Reckoned on cases treated exclusive of cases treated in the ophthalmic ward of the Medical College Hospital.

It will be seen that there was an increase in both classes of patients in all the hospitals but the Mayo institutions and Presidency General Hospital. The death-rate among the in-patients was 124·15 per 1,000, or 2 per 1,000 less than in 1889. Cholera patients declined from 795 to 528, and the fatal cases from 419 to 291, which accords with the diminished prevalence of the disease among the general population. On the other hand, there was an increase of cases of small-pox from 64 to 321, and of these more than a half (183) were found to be unprotected by vaccination. Dysentery and diarrhœa were less common than in the previous year, while the number of cases of malarial fever rose from 3,867 to 4,366, of which 289 proved fatal. There were 2,080 important surgical operations performed against 1,926 in 1889, and among them there were 88 deaths, being in the ratio of 39 per 1,000, which is identically the same as in 1889.

Punjab.

The total number of hospitals and dispensaries open in the Punjab during 1890 was 216, or eight more than in the previous year. At these 2,580,496 patients were treated, being an increase of 268,455 over the number of 1889. This large increase was due to a great extent to the exceptional unhealthiness of the year, the mortality being greater than in any previous year; a portion of the increase, it is stated, must also be ascribed to the natural expansion in the work of the dispensaries and to the increased popularity of these institutions. The increase in attendance was more or less marked in the majority of the classified diseases, but particularly so in malarial fevers, from which 580,273 patients were treated, being an increase of 161,105 over the number in 1889. "Malaria," the Local Government remark, "leaves its mark on "the inhabitants of the areas affected, and it is inevitably followed by depressed vital "conditions, by liability to other diseases, and by an increased mortality. We must, "therefore, expect to find a very considerable increase in the attendance for other "diseases, especially in the following, which are more or less influenced by malaria, "viz., diseases of the digestive system, including those of the liver, &c., which show "an increase of 35,263; dysentery, 15,649; diseases of the spleen, 7,245; scurvy,

"3,416; and debility, 2,380." There were 2,702 cases of cholera compared with 1,807 in 1889. The number of in-patients treated was 48,147, against 45,125 in the previous year, and the ratio of deaths per 1,000 among them was 54·5 and 47·4 respectively.

The number of major operations performed amounted to 11,105, or 795 less than in the previous year. This decrease is, however, only apparent, as the setting of certain fractures was excluded from the list of major operations in 1890; and as these in 1889 numbered 1,500, there was in reality an increase in major surgical work.

North-Western Provinces and Oudh.

During 1890 there were 18 new dispensaries opened in the North-Western Provinces and Oudh, and two were closed, the total at the end of the year being 295. Statistics, however, were furnished for only 271, at which the total number of patients treated was 2,890,369, being an increase of 250,276, or 9·4 per cent. on the number of the previous year. Of the patients treated 577,083 were women and 691,490 were children, both showing a marked increase on the figures of the previous year, which were 513,254 and 630,765 respectively. The in-door patients numbered 52,566, as compared with 51,705 in 1889, and among them there were 3,089 deaths, giving a death-rate of 58·7 per 1,000, which was identically the same as in the previous year. Of the diseases for which the patients were treated 558,937 were suffering from malarial fevers, against 458,785 in 1889; of cases of cholera there were 7,423 against 4,146, and cases of diseases of the eye increased from 198,014 in 1889 to 218,468. That the increase of patients was not altogether due to the greater unhealthiness of the year as compared with 1889 is shown by the fact that it extended to the number of surgical cases which rose from 135,769 to 141,950. These included 18,584 major operations, of which 14,750 resulted in cure and 315 were fatal. The new dispensaries accounted for 68,503 of the total increase of patients.

Burma.

The same 35 dispensaries were in operation in Lower Burma in 1890 as in the previous year, but the attendance increased from 249,494 to 262,801. Of the total patients, 129,803, or nearly half, were Burmese, which is a satisfactory increase on 116,887, the number treated in 1888. Indoor patients increased from 15,805 to 17,421, and of these 12,920 were cured and 1,511 or 86·8 per 1,000 died, against 1,266 deaths or 80 per 1,000 in 1889. The year's work showed a decrease in the number both of major and minor operations performed, the former having fallen from 323 to 277, and the latter from 6,868 to 6,842.

During the year 39 dispensaries were in operation in Upper Burma, being an increase of two as compared with 1889, and the number of patients who attended them amounted to 99,412, or 29,266 more than in the previous year. Of the total 5,704 were in-patients, and 93,708 were out-patients. The Burmese resort to these institutions in considerable numbers, the proportion being 60 per cent. of the total. Eighty-one major and 1,570 minor operations were performed during the year.

Central Provinces.

There were 107 hospitals and dispensaries at work in the Central Provinces during 1890, or three more than in the previous year; and the total number of patients rose from 848,243 to 875,104. The increase, however, was confined to out-patients, as there was a decrease of 271 in the in-patients, which was attributed partly to greater care in the selection of cases for admission, but chiefly to the smallness of the dieting allotments. Among the 7,885 in-patients there were 794 deaths or 100·7 per 1,000, a ratio nearly 30 per 1,000 lower than that of 1889. There were 18,656 surgical operations performed against 20,052 in 1889. Although on the whole there was a decrease of 1,396 surgical operations, major cases rose from 1,056 to 1,165. Except for an epidemic of influenza the year was a comparatively healthy one. The prevalence of influenza and the diminution of other kinds of sickness were reflected in the return of diseases treated at the dispensaries during the year.

Assam.

The number of dispensaries open in Assam during 1890 was 69, an increase of five on the previous year. In these, 265,427 persons sought relief, of whom 3,704 were in-patients, and 261,723 were out-patients, against 4,158 and 255,724 respectively in 1889; there was therefore a total increase of 5,545 patients. Among the in-patients there were 705 deaths, being in the ratio of 190·3 per 1,000 as against 205·1 in 1889. Of the several diseases from which the patients suffered, fevers and diseases of the skin accounted for about half of the total number; next came worms, diseases of the digestive system, rheumatic affections, and spleen diseases. In the number of surgical operations performed there was a satisfactory increase. Major operations showed an increase of 103 cases, the number actually performed being 640 against 537 in 1889.

Madras. In the Madras Presidency the number of civil hospitals and dispensaries in operation during 1890 increased from 393 in 1889 to 415, but the returns of nine of these were omitted, as the revised figures were not submitted in time. The number of patients rose from 2,517,603 to 2,711,157. There was thus an increase of 193,554 cases, which was attributed partly to the greater number of medical centres at work, and also to the general unhealthiness of most of the districts, influenza, cholera, and small-pox being very prevalent during the year. The in-patients numbered 47,739, and of these 29,710 were cured, 8,235 were relieved, and 3,045 died, the latter being in the ratio of 63·7 per 1,000 against 69·9 in 1889. Malarial fevers contributed the largest number of cases (219,186), followed by worms and rheumatic affections with 147,506 and 121,483 cases respectively; from cholera there were 8,991 cases under treatment, and from small-pox 424. The cases of primary and secondary syphilis under treatment were 31,201 against 31,042 in 1889, and from gonorrhœa and all other venereal diseases the admissions rose from 20,444 to 24,819. The number of surgical operations performed was 90,165 against 86,501 in the preceding year. Of these, 6,305 were major operations against 5,123 in 1889, the fatal cases being in the proportion of 4·8 and 5·1 per cent. respectively.

Bombay. The number of civil hospitals and dispensaries at work in the Bombay Presidency during 1889 was 248, being an increase of four on the number of the previous year. The total number of patients treated was 1,723,584, or 26,970 more than in 1889. Of the 38,512 in-patients 26,237 were cured, and 2,611, or 67 per 1,000 of the total treated, died, against 80 per 1,000 in 1889. Malarial fevers as usual headed the list of diseases from which relief was sought, and the number of cases rose from 262,791 in 1889 to 288,919; cases of skin diseases declined from 226,490 to 210,401. Cholera and small-pox cases were very few in number; the former decreased from 5,318 to 691, and the latter from 944 to 247; cases of dysentery decreased considerably, and under diarrhœa also there was a marked decrease; venereal diseases gave 33,459 or 1·9 per cent. of the total treated, against 30,028 or 1·7 in the previous year. The number of surgical operations performed was 87,582, of which 5,770 were of a major kind, and of these 4,884 were cured, and 177 or 3 per cent. were fatal. During the year two sums of Rs. 1,25,000 and Rs. 1,00,000 were contributed by Sir Dinsha Maneckji Petit, Bart., for the establishment of a hospital for women and children and of a leper asylum at Trombay respectively. Rs. 13,000 were also received in connexion with the construction of two wards in the Civil Hospital, Ahmedabad, and Rs. 10,000 for the institution of a lectureship in the Grant Medical College.

Berar. The same 44 dispensaries were open in Berar in 1890 as in the previous year. The number of in-patients was 3,075, and of out-patients 274,195, being an increase of 302 and 3,756 respectively compared with the figures of the previous year. The year being a healthy one, the increase was considered satisfactory. Of the in-patients, 84·6 per cent. were cured and 143 died, which gives a death-rate of 46 per 1,000 of total treated against 55 in 1888. Of the diseases under treatment there was a considerable decrease in fever cases, skin diseases, and diarrhœa, while the number treated for cholera fell from 2,703 in 1889 to 68. On the other hand, there was an increase in the number of patients treated for diseases of the eye, ear, and digestive and respiratory systems. There were 142 major and 9,971 minor surgical operations performed as against 230 and 7,937 respectively in 1888. The apparent decrease in major operations was attributed to a stricter classification of surgical work. The Resident, however, thought that a total of 142 operations of this class was a very small figure for a population of nearly three millions.

Voluntary Venereal Hospitals.

Pending the issue of revised rules under the new Cantonment Act for the prevention of venereal diseases, the Government of India directed the discontinuance of the preparation in the forms hitherto used of statistics of the operations of the hospitals maintained for the treatment of venereal diseases on the voluntary system, and that in future the reports on the working of the hospitals in question should be restricted to statistics regarding prostitutes. The heading Voluntary Venereal Hospitals was also to be substituted for that of Lock Hospitals.

Bengal. At the voluntary venereal hospital at Barrackpore 24 women were admitted during 1890, and by the end of the year they were all discharged. Among the troops at this

station (average strength 321) there were 142 admissions for venereal disease, or a ratio of 442 per 1,000 of strength, a satisfactory result when compared with 218 admissions or 666 per 1,000 in the preceding year. At the cantonment hospital at Dum Dum 18 women were admitted, and they were all discharged but one, who remained under treatment. The total number of admissions of European troops into hospital at this station for venereal disease was 315, out of an average strength of 825 men, being in the ratio of 381·81 per 1,000, which is an improvement on 366 admissions or 426·57 per 1,000 of a strength of 858 in 1889. At the hospital at Jalapahar in Darjeeling 12 women sought admission during 1890, and they were all discharged before the year closed. There were no patients in the venereal hospital at Dinagpore, the Commissioner of Patna therefore recommended that it should be closed.

Punjab. The number of women under treatment at the 17 voluntary venereal hospitals in the Punjab during 1890 was 431, which compares favourably with the previous year, when only 252 admissions were recorded. Before the close of the year one woman died and all the others were discharged but 23, who remained under treatment. The Inspector-General of Hospitals doubts whether these hospitals are much resorted to by the class for whom they were intended, but he considers it too early to form any definite conclusions as to their value. "As a charitable effort," he says, "they are not "without merit, and if they were largely resorted to they might be productive of "some good. No opinion can be given as to their influence, if any, in checking the "prevalence of venereal disease."

Madras. During the five years 1883 to 1887, when the Contagious Diseases Act was in operation, the average number of admissions into the Madras Lock Hospital was 549, but under the voluntary system the admissions during 1889 and 1890 were 272 and 360 respectively. Though showing a falling off as compared with previous years, the results of 1890 are considered satisfactory, "inasmuch as they show a tendency to a "gradual increase of admissions under the new system." Including the 57 patients remaining in hospital at the close of the previous year, the total number of patients under treatment during 1890 was 417, and of these, 336 were discharged and 21 died, against 10 deaths in 1889. The increase in the death-rate was due to the fact "that "admission into the hospital is not now sought till the disease is in an advanced state, "and the constitution has been completely undermined and saturated with venereal "poison." As regards the British troops in the city of Madras during 1890, statistics show an improvement over previous years in the admission from venereal affections, but the type of disease for which the soldiers were mostly admitted was reported to have been of a more virulent character, necessitating a prolonged stay at the hospitals for recovery. Altogether there were 321 admissions against 379 in 1889 on a strength in both years of 584, the ratio per 1,000 being 549·6 in 1890 against 631·8 in 1889.

Bombay. In the Bombay Command there were 6,579 admissions on account of venereal disease, giving a ratio of 515·36 per 1,000 of average strength against 481·49 in 1889, showing an increase of 26·87. Statistics show that before 1886 the ratio never exceeded 293, but since the abolition of compulsory examination, it has steadily increased. In 1887 the ratio was 337 per 1,000, in 1888 it was 357, and in 1889 it increased to 481·49. Among the 21 stations, Ahmednagar returned the highest ratio, viz., 973·0 per 1,000. Of an average strength of 667 at this station, there were 655 admissions for venereal diseases. Kamptee came next with a ratio of 735·7, followed by Kirkee with 663·11; and in five other stations the average for the Command was exceeded. In the 13 Cantonment hospitals there were 621 women under treatment during the year, of whom 550 were discharged.

Lunatic Asylums.

Bengal. At the five asylums in Bengal 1,208 lunatics, including 221 fresh admissions, were under treatment in 1889, being an increase of 4 on the number of the previous year. In the course of the year 86 patients were discharged as cured, 21 as improved, and 10 otherwise discharged. The method of classifying the different forms of insanity underwent revision during the year with the object of securing some uniformity of classification, but the Inspector-General (Dr. Hilson) pointed out that it was impossible to expect absolute accuracy and uniformity, as the diagnosis depends almost entirely upon the personal bias of the Superintendents. This was clearly exemplified by the widely different proportions of persons whose insanity was attributed to ganja smoking admitted to the several asylums during the year. Ganja smoking was attributed as

the cause of insanity in 56 cases, and spirit drinking in seven, while opium eating and smoking caused comparatively little insanity. The health of the inmates was remarkably good, and the mortality fell from 89·4 per 1,000 of average strength in 1889 to 69·4. Cholera was completely absent from the asylums, and with the exception of a few cases of small-pox and chicken-pox at Dullunda, Berhampore and Patna, and the prevalence of influenza at the two last-named asylums and Dacca, there was no visitation of any serious epidemic of disease.

The criminal lunatics under confinement increased from 526 in 1889 to 539, of whom 88 were fresh admissions and 11 were re-admissions. By the close of the year the number was reduced to 465 by 50 discharges and transfers, and 24 deaths.

In the Bhowanipore Asylum, containing European and Eurasian patients only, the population was slightly larger than in 1888 (48 against 45), and the proportion of recoveries was 17·39 per cent. of average strength against 15·9 per cent. in 1889. The general health of the patients was very good, there was no epidemic visitation and the inmates did not suffer from influenza, which was very prevalent at Calcutta at one time of the year. There were three deaths; one, an old woman, who had been in the asylum 20 years, died of general paralysis, and two other women died from apoplexy.

North-Western Provinces and Oudh.

The daily average population of the four asylums (Agra, Bareilly, Benares, and Lucknow) in the North-Western Provinces and Oudh during 1889 was 1,001, or 9 less than in the previous year. The new admissions fell from 289 in 1889 to 254, which was due to a more rigid scrutiny of the claims for admission and also to the transfer of harmless criminal lunatics to the jails. By the close of the year 107 of the total patients had been discharged as cured, and 92 died, the deaths being in the ratio of 91 per 1,000 against a ratio of 80 in 1889. Cholera was present only in the Bareilly asylum, where there were 7 fatal cases. There was a falling off in the number of employed during the year in all the asylums as well as in the amount of their earnings. An experimental dairy farm was started at Bareilly.

Punjab.

The total number of lunatics under treatment in the two asylums (Delhi and Lahore) in the Punjab during 1889 was 419, of whom 85 were fresh cases, and 1 was a re-admission. By the end of the year the population was reduced to 317 by 67 discharges (55 as cured) and 34 deaths. Sixty-seven of the inmates were criminal lunatics, 18 of whom were admitted during the year. In Lahore asylum there was more sickness among the inmates than in 1889, but the number of deaths fell from 37 to 27, the death-rate being 115·3 per 1,000 against 146·9. At Delhi there were 7 deaths, equal to 75·2 per 1,000 against 6 or 62·3 in 1889. The majority (40·7 per cent.) of the deaths in the Lahore asylum were due to bowel complaints, this unusual prevalence being attributed to the fact that several of the fatal cases were confirmed mud-eaters. During the year considerable improvements were being carried out in both asylums. At Lahore, new building arrangements were being completed for the separation of the different classes of lunatics; tanks for storing the municipal drinking water were also being prepared. At Delhi the chief improvement was the completion of surface drainage throughout the asylum.

Lower Burma.

The lunatics under confinement in the Rangoon lunatic asylum during 1889 numbered 354, of whom 89 were fresh admissions and 7 were re-admissions; but of the 89 admissions only 48 were Burmese. In view of the growing increase in the population of the asylum, it had been decided to build a new asylum in Mandalay for the accommodation of 150 lunatics. At the end of the year the number of inmates was reduced to 257. The mortality was exceptionally heavy, no less than 40 patients having died, a much larger number than in any previous year. The death-rate was equal to 154·1 per 1,000 of average strength against 70·1 in 1889. It is stated that the deaths were for the most part due to diseases of long standing, and that there were no specially unhealthy conditions to account for the excessive mortality.

Central Provinces.

The total number of inmates in the Nagpur and Jubbulpore asylums of the Central Provinces during 1889 was 308 or 17 less than in the previous year. Of these 53 were fresh cases, and 2 were re-admissions. There was no overcrowding in either of the institutions, the daily average of inmates being much below the accommodation. In the course of the year 28 patients were discharged, 22 as cured or improved and 21 died. Except for the epidemic of influenza, which was general in both asylums, the year was a healthy one, although, owing chiefly to that disease and to fevers the admissions into hospital at Nagpur were greater than in 1889. Nagpur asylum recorded 8

deaths, equal to 67·6 per 1,000 of its average strength, against 33 or 254·7 in 1889, and Jubbulpore 13 or 99·4 against 21 or 151·6. There were no cases of cholera at either of the asylums.

Assam. The Tezpur lunatic asylum, Assam, had a population of 142 in 1890, an increase of 22 on the number of the previous year; 36 were new admissions and 3 were re-admissions. Thirteen patients were discharged during the year, 6 as cured, 9 died, and 2 escaped, leaving 118 still under treatment at the end of the year. There were fewer admissions to hospital among the patients than in 1889, but the death-rate rose from 73 to 81 per 1,000 of average strength. The mortality in the majority of cases was due to chronic diseases of the internal organs; no deaths were due to any epidemic disease. Several improvements were effected in the asylum during the year; a pucca building in two separate wards to accommodate 30 criminal lunatics were built, and an additional female ward was sanctioned.

Madras. At the three lunatic asylums in the Madras Presidency, viz., Madras, Calicut, and Waltair, there were 829 insanes under treatment during 1890, of whom 197 were fresh admissions. Compared with the previous year the population increased by 37. The aggregate number discharged was 118, of whom 64 were cured. The general health of the inmates of the asylum was very unsatisfactory and the deaths rose from 51 or 79·2 per 1,000 of average strength in 1889 to 114 or 184 per 1,000. The increase in the death-rate was chiefly due to the heavy mortality in the Madras and Calicut asylums, where the deaths rose from 43 and 8 respectively to 81 and 27, the increase being partly accounted for by an outbreak of cholera, causing 15 deaths in the former and 12 in the latter; the mortality from diarrhœa and dysentery was also in excess of the previous year. There were only two deaths in the Waltair asylum. Out of the total population of 829, the causes of lunacy were known only in 346 cases. Amongst those admitted during the year the cause was ascertained only in 63 cases. The criminal lunatics numbered 159, of whom 16 were admitted during 1889. At the end of the year there remained 137 in confinement, 7 having been discharged and 15 having died.

Bombay. The total number of lunatics under treatment in the six asylums in the Bombay Presidency during 1890 was 1,006 (or 89 more than in 1889); of these 273 were new admissions and 19 were re-admissions. By the close of the year the population was reduced to 690 by the discharge of 238 patients and 78 deaths. Of those discharged only 114 were cured. In 407 cases the insanity was attributed to physical causes, and in 90 to moral causes. Amongst physical causes, 217 cases were due to the use of intoxicants. The general health of the patients was not so good as in 1889, and the death-rate rose from 95·4 per 1,000 of average strength to 110. Of the 78 deaths 18 were due to diarrhœa, 9 each to dysentery and debility, 8 to cholera, and 6 to epilepsy. Altogether there were 135 criminal lunatics under confinement or four more than in 1889, 23 being fresh cases. By the discharge of 12 and the death of 21 there remained at the end of the year 102 lunatics of this class in the asylums.

Medical Schools.

Bengal. The total number of medical students in Bengal at the close of the session of 1890–91 was 1,184 (including 69 females) against 1,016 in the previous year. On the opening of the session in the Calcutta Medical College, 149 students resumed their studies, 13 rejoined, and 119 new students were admitted, making a total of 281 against 234 in 1889–90. At the close of the session the number was reduced to 197. As regards the examinations, 3 candidates (including 1 who passed the combined M.B. examination) passed the First M.B. examination, 3 candidates passed the Second M.B. examination, and 7 candidates passed the First and 13 the Second L.M.S. examination. Thirty-one candidates (including 1 female) passed the Preliminary Scientific L.M.S. examination, and 11 candidates (including 1 female) passed the Preliminary Scientific M.B. examination. From the female certificate class 5 passed the final examination and obtained the license to practice medicine and surgery.

The Campbell Medical School had 264 pupils (including 28 females) on its rolls. Out of 94 second-year students who appeared for the first license examination 47 (including 8 females) passed. For the second or final license examination, all but 9 of the 57 candidates (including 10 females) were successful and obtained certificates. Of the 90 first year students 73 (including 4 females) received promotion. In the

male compounder class there were 54 students. A female compounder class was opened during the year. Five Eurasians and 48 Native candidates appeared at the half-yearly examination of compounders, and all passed except 8 Native students. At the Dacca Medical School there were 164 pupils on the rolls. For the final examination there were 17 failures out of 56 candidates. The Temple Medical School had 157 students on its rolls. Of the 30 second-year students who appeared at the first license examination 18 passed, and at the second or final examination for the license 26 passed out of 33 third-year students. Four students from the compounder class passed their examination. At the Cuttack Medical School there were 67 students on the rolls. Of the 7 female students under tuition 3 belonged to the third-year and 4 to the first-year class. The former passed their final or diploma examination with success. The latter did very well, all but one having been promoted to the second class.

North-Western Provinces and Oudh.

The number of students under instruction at the Agra Medical School during 1890-91 was 219 or 10 less than in the previous year. Of these 38 were females, being a decrease of 6 on the number of 1889-90. In the male section, the course of study extends over four years, except in the case of pupils of the military class, who receive in their second year instruction which the others receive spread over their second and third years. During the four years' course four examinations are held, two of the nature of ordinary class examinations, and two at the end of the second and fourth years respectively, by passing which students obtain first admission to the final examination, and, finally, either Government service or diplomas. The slight falling off in numbers was accounted for mainly by the new rule excluding from the private class all male pupils who had not passed the middle-class examination. The first-class of male students showed a large increase as compared with the corresponding class in the previous year, but in the remaining three classes there was a considerable decrease. The results of the examinations showed a slight falling off in the average number of marks, which, however, was chiefly noticeable in the case of private students. At the final examination of the first or senior class, 16 out of 21 military students, all but one of the 17 civil students, and 11 out of 19 of the private students, passed.

In the female section of the school 8 of the 38 pupils obtained diplomas, and were all immediately supplied with appointments. The examination passed by the class of which they were members compares creditably with the corresponding class of male students. The demand for female practitioners is reported to be so great that the services of all the pupils who can pass out within the next four years have already been bespoken.

Punjab.

The total number of students at the Lahore Medical College and School for 1890-91 was 297, or 3 less than in the previous year. Of these 124 (including 4 females) were in the College or English class, and 173 (including 4 females) were in the School or Hindustani class. The College did good work during the year, but the result of the final examinations was not considered satisfactory. Three of the students, however, attained the M.B. degree of the Punjab University, while two of the old students who had proceeded to England to prosecute their studies succeeded in winning appointments in the Indian Medical Service in the open competition. The results of the School examinations also were unsatisfactory, only 59 per cent. of the candidates having passed their final examination against 72 per cent. in 1889-90. The Lady Lyall Home for female students, which adjoins the College, was opened during the year, and "promises," the Director of Public Instruction reports, "to confer inestimable "benefits on the female students of medicine, who can thus be provided during their "training with a suitable home, where they will be thoroughly supervised. Such a "home should remove the objections of many women to entering on a medical career, "and it is to be hoped, when its advantages are well known throughout the Province, "it will materially aid the cause of medical education."

Madras.

The strength of the Madras Medical College in 1890-91 was 412 against 337 in the previous year. The College continued to do good work in the training of female medical practitioners. Of the 47 female students, 7 belonged to the College, 33 to the Apothecary, 6 to the Hospital Assistant, and 1 to the Chemist and Druggist Departments. The results of the University examinations were not satisfactory. Only three College students out of 38 passed the first L.M.S., but at the second L.M.S. examination 6 out of 13 passed, amongst them 1 female, who was the first Native woman who has obtained this distinction. Out of 49 students in the Apothecary

Department 33 were females, 5 of whom were in their fourth year, and of these 4 passed the final examination. In the Hospital Department there were 182 students, and the results of the final examination were very good, all but one of the 50 sent up having passed.

The Local Fund Medical School, Nellore, had only 10 pupils on its rolls or 6 less than in 1889–90, the decrease being due to fresh admissions not having been made before the close of the year. The Prince of Wales' Medical School, Tanjore, had a strength of only 18 in 1889–90, but in the year under notice the school partly regained the loss it had sustained in numbers.

Bombay.

The attendance at the Grant Medical College, Bombay, increased from 162 at the close of the session of 1889 to 203 (including 30 females) at that of 1890. The ordinary classes made better progress than usual. At the first University examination in medicine there were 85 candidates, of whom 44 passed, 1 only being placed in the first class; for the second examination 30 candidates out of 70 passed, 3 of whom were placed in the first class. For the L.M.S. examination there were 45 candidates, of whom only 10 passed, 2 of them coming out in the first division. Two women passed their final examination in the Certificated Practitioner's Class. Two soldiers' wives and 5 nurses passed through a course of instruction in midwifery and nursing, and on examination were found qualified for the diploma.

At the Government Medical Schools at Poona, Ahmedabad, and Hyderabad, there were 212 pupils. At the final examinations 26 pupils were found qualified as Hospital Assistants.

X.—SANITARY WORKS.

Bengal.

Satisfactory progress was made during 1890 in improving the sanitary condition of Calcutta. Sewer construction was extended by nearly 2 miles, and channels of surface drainage by 4½ miles. The number of premises connected with the sewers amounted to 680, and 6,736 house drains were examined, of which 46 per cent. were found defective. A scheme for draining the amalgamated area, and for improving the Calcutta system had been prepared by Mr. Baldwin Latham, and according to the estimates, will cost Rs. 1,70,69,000 to carry it out. Good progress was made in extending the water-supply. At the close of the year the length of mains and services on the filtered system amounted to 232 miles (including 71 miles in the added area), of which 47 miles were laid during the year, and the number of premises connected with this service was 657, bringing the total up to 19,850. The length of the unfiltered system amounted to 66 miles, of which 2 miles were laid during 1890. The average daily supply of filtered water per head of population was increased from 35 gallons in 1889 to 39 gallons in the year under notice, and the supply to the new area was 15 gallons per head daily. A most important work connected with the water-supply was the commencement of the pumping station at Bhowanipore for supplying the southern portion of the new area. In matters of conservancy considerable activity was displayed.

The municipalities of the interior of Bengal spent about 42 per cent. of their total income (Rs. 31,38,641) on sanitary improvements. The most important works undertaken were the Rungpore Canal for drainage and water-supply, and the extension of the waterworks at Dacca, which latter it is expected will give a further supply of 200,000 gallons to the town per diem. In all about five gallons of water will then be supplied per head of population. At Bhagalpur works were in progress for the further extension of water pipes, and at Faridpur a tank was being excavated. A scheme for the discharge of the sewage from Fort William into the Calcutta sewers was under the consideration of the Government of India. A beginning was made in rural sanitation, and though the actual progress made was not great, the District and Local Boards spent Rs. 43,762 on minor improvements, such as sinking wells, excavating and clearing tanks, and improving drainage channels. In addition a sum of Rs. 2,65,785 was spent by private individuals on similar measures. "The question " of rural sanitation," the Local Government observe, "is one of extreme difficulty " in Bengal, not merely because the financial resources of the District Boards are " wholly inadequate to the work to be done, but also because no village agency exists " competent to carry out the simpler measures which are necessary to guard against " the pollution of the village site, and the fouling of the water-supply." The Government, however, have made suggestions by which the boards might effect some improvement in the healthiness of localities. The Sanitary Board of the province was established in December 1889, but did not enter fully upon its functions until August 1890, when the Sanitary Engineer joined his appointment. Several important matters have since engaged their attention, such as the drainage and water-supply of Howrah, the drainage of certain municipalities on the left bank of the Hughli, and the towns of Serampore and Puri. Works in connexion with some of them have already been taken in hand. Besides these the Board considered and approved several minor schemes for improving the drainage of the municipalities of North Dum Dum, Maniktola, Cossipur-Chitpur, Balli, and Utterpara, but only in the latter was any real progress made.

Punjab.

The most important sanitary work in progress in the Punjab during 1890 was the Delhi waterworks, on which Rs. 2,13,177 were spent out of an estimated cost of 10 lakhs. The conservancy tram for the city was completed, and a drainage scheme was under consideration. The work of further extending the Rawalpindi municipal waterworks was completed, and the Peshawar and Abbottabad waterworks were approaching completion. In the little town of Kalka a new water-supply was introduced. "An unambitious work," it is stated, "but one which should prove of " much value as providing for the health of the residents at what is now the railway " terminus from which travellers start for Simla." Fair progress was also made with the drainage works of Ludhiana and Gujranwala. At Amritsar the important work of the filling in of the ditch was completed, and over 200 acres of land had been reclaimed and brought under cultivation. The total cost of this work, including the

cost of gardens, has been Rs. 2,56,568. The extra-mural drainage of Jullundur city and the drainage of the town of Bungali were completed. A combined scheme for the drainage of Rawalpindi city and cantonment, and schemes for the water-supply of Murree, at a cost of 7½ lakhs, and for the Dalhousie municipality were under consideration. A drainage scheme for the village of Mozung, which adjoins the civil station of Lahore, had been sanctioned, but the work still remained to be carried out. The amount realised for the sale of manure and town sweepings in the several municipalities for the year amounted to Rs. 1,20,790, which is a considerable increase on previous years. The total expenditure of municipal committees on sanitation during the year was equal to nearly 26·69 per cent. of their gross income against 21·5 per cent. in 1889. A Sanitary Board was constituted in the province in August 1890. The functions of the board are mainly those of a consultative body in sanitary matters, but the Lieutenant-Governor of the province is prepared to delegate to it from time to time such powers as might be necessary. No schemes for important sanitary improvement came under its consideration during the remaining portion of the year.

North-Western Provinces and Oudh.

In the North-Western Provinces and Oudh, sanitary work was prosecuted with considerable activity during 1890. Water-supply schemes were undertaken or continued in Agra, Allahabad, and Benares, and similar projects were under consideration for Cawnpore, Naini Tal, Lucknow, and Mussoorie. The Agra works were opened by the Viceroy in December 1890, and since then a population of about 100,000 has been provided with a plentiful supply of water of excellent quality. The cost of these works was about 11½ lakhs. The Allahabad works are designed for a supply of 2,500,000 gallons of water per day; 20 gallons per head of population in the civil station, and 15 gallons in the city. The Benares waterworks were advancing towards completion, and are designed to supply 4,000,000 gallons daily to a population of 225,000. The estimated cost of these works is 24 lakhs. Drainage works for this city were about to be taken in hand, their estimated cost being about 16 lakhs of rupees. Several of the municipalities expended considerable sums on sanitary measures. At Jhansi the drainage scheme was completed and some improvements effected. A sanitary survey of the larger municipalities was taken in hand by the Sanitary Board, and the question of improving the drainage of tracts which had become water-logged, owing to railways and canals, was considered, and reports on the subject submitted to the Local Government. The Board also submitted recommendations for the better registration of vital statistics in rural areas and in municipalities, which were in the main accepted by the Government. A Bill for village sanitation was also discussed, and, after undergoing certain modifications by the Lieutenant-Governor of the province, it was circulated for the opinions of officers and native gentlemen.

Burma.

In Lower Burma no large sanitary works were undertaken during 1890, but the Public Works Department spent Rs. 69,985 on sanitary improvements, and many of the municipalities devoted a considerable portion of their income to conservancy arrangements and minor matters connected with sanitation. At Rangoon the Shone and Ault hydro-pneumatic system of drainage was fully worked from the 28th April 1890. The working of this system has been subjected to much criticism, but until all houses in the town proper, it is stated, are connected with the sewers, neither the cost nor the efficiency of the system can be fairly judged. Only 10 per cent. of the houses which might be connected had been united to the system. The reclamation of low-lying ground to the east of the town was continued at a cost of Rs. 79,109, and large sums were expended on the construction of public latrines and urinals, and in extending the sewage system to the suburbs. The Bassein conservancy tramway, commenced in 1889, was completed, and schemes for the reclamation of swampy land in the vicinity of the town were under consideration. At Prome the new waterworks were acting satisfactorily, and 60 new hydrants had been erected in private premises. The Sanitary Board for the province had been in existence since December 1888, and since then it had dealt with questions affecting village sanitation, water-supply schemes for municipalities, sewage-farming, and improvement of the sanitary condition of the suburbs of Rangoon, but owing to the want of a Sanitary Engineer no practical progress had been made.

In Upper Burma something was done in most of the towns in the way of scavengering and conservancy. In Mandalay a scheme for the removal and disposal of night-soil was being tested, and the question of the drainage and water-supply of that town was under the consideration of the municipal committee.

Central Provinces.

In the Central Provinces no large sanitary projects were carried out during the year, with the exception of the extension of the water-supply of the towns of Nagpur and Jubbulpore; but the Sanitary Commissioner reports that in all districts some useful sanitary improvement had been effected in large towns. "There can be little doubt," he says, "that in the course of a few years the pressing sanitary requirements of the "larger towns will be met, for already there is evidence of increasing interest on the "part of municipal committees in all questions affecting the health of the people." Schemes for the water-supply of Burhanpur, Khandwa, and Raipur were about to be taken in hand. In connexion with the last of these three projects the Raja of Nandgaon had contributed two lakhs. The total expenditure on sanitation in towns amounted to Rs. 1,87,678, of which 67 per cent. were spent on conservancy. The provincial Sanitary Board held only one formal meeting during the year, when the question of a sanitary survey of municipalities was discussed. Surveys were instituted of the towns of Nagpur and Jubbulpore, with a view to the introduction of drainage schemes which are urgently required. Very little progress was made during the year in rural sanitation. Rules had been issued under the Village Sanitation Act, and the sanitary rules under the Land Revenue Act had been revised, but the question of providing funds for carrying out and enforcing those rules was still under consideration. In their Orders on the Sanitary Commissioner's report, the Government of India have directed attention to the necessity for more vigorous action on the part of the Board, there being many points, they say, in the matter of improving sanitary arrangements in the Central Provinces to which its attention might be directed with advantage.

Assam.

No sanitary works of any great importance were carried on in Assam during 1890. Out of their total income of Rs. 1,63,260 the municipalities spent on sanitary improvements Rs. 94,060. A little less than a third of this amount (Rs. 30,555) was expended on conservancy and Rs. 15,525 on water-supply. It is reported that strict measures are contemplated with a view to provide a proper water-supply for the town of Sylhet—a matter which appears to have been neglected for some years past. The question of improving the sanitary condition of both rural and urban tracts continued to occupy the attention of the Local Government and the Sanitary Board. The latter have inaugurated a scheme of sanitation for selected villages, having for its object the improvement of the drinking water-supply, the establishment and maintenance of a proper system of drainage, and the prohibition of deposits of manure and rubbish in places where they would be injurious to the public health. The work of sanitation in towns and municipal areas has been systematically taken in hand under the supervision of the Board. A sanitary survey was made of each place, and its sanitary wants were thus ascertained with a view to meeting them as funds might permit.

Madras.

In the Madras Municipality the scheme for the new water-supply was amended to meet the increased demand during the last few years. Satisfactory progress was made in extending the existing supply by the laying of pipes, fountains, &c.; but the supply from the Red Hills Lake had decreased from 18 to 16 gallons a head of population per day, with a further deterioration in quality. Considerable extensions were made in the drainage of the town. On the Black Town drainage scheme a sum of Rs. 10,58,635 had been expended up to the end of March 1891. There remained only 1,196 feet of surface drains to be constructed. A scheme for draining Mylapore awaited the report of the Special Committee appointed by Government on the general question of the drainage of Madras.

Out of the total estimated income (Rs. 21,17,640) of the 55 municipalities, excluding Madras, in 1890–91 the expenditure of Rs. 7,09,092 or 33·5 per cent. was sanctioned for sanitation, but of this sum only Rs. 4,20,513 or 59·3 per cent. were spent during the nine months which had elapsed by the end of the calendar year 1890. The Local Fund Boards also had only expended Rs. 29,51,270 or 55 per cent. of their budget allotment for sanitation during the same period. The Local Government, however, have taken steps to secure better results in future. The only sanitary work of any magnitude completed during the year was the Bugga water project for Cuddapah Town, the water of which was in use and was reported to be very wholesome; but water-supply schemes were either under preparation or had been sanctioned for eight other municipal towns. Sanction was given for drainage schemes for Kumbakonam, Ootacamund (Kandal Bazar), and Coonoor, and similar projects for other municipalities were under consideration. During his tour of inspection the Sanitary Commissioner, accompanied in most cases by the chairman and some of the municipal councillors, discussed the sanitary defects and needs of their towns, and took the opportunity also of pointing out to them the more glaring defects of the sanitary condition of their

dwellings and surroundings, and impressing upon them the importance of the positions they respectively held as guides to their less favoured and poorer countrymen in matters affecting the general sanitary improvement of their towns. The Sanitary Engineer also made an extensive tour of inspection, visiting 20 towns with a view to the introduction of water-supply and drainage schemes where such works did not exist, and the improvement of similar existing works. Many towns, he reports, "have eagerly grasped the earliest opportunity of making some advance towards "the preparation of schemes for drainage or water-supply." This officer also prepared an elaborate scheme for the improvement of the River Cooum at Madras, and it was under the consideration of the Local Government.

Bombay.

The expenditure of the Health Department of the City of Bombay in 1890–91 on sanitary measures amounted to nearly 12 lakhs of rupees. Important progress was made with the Tansa waterworks, the dam being practically completed by the end of the year, and of the duct works there remained only about 900 lineal feet of tunnelling for completion. This dam contains 11,000,000 cubic feet of masonry, and the estimated cost of the whole scheme is Rs. 1,48,50,000. The scheme for bringing water from the Pawai Valley was finished before the monsoon, and answered its purpose satisfactorily; and some important repairs and improvements were effected on the Bhandawada and the Malabar Hill reservoirs. In various localities of the city, 28,000 feet of new mains were laid, 6,115 feet of old pipes were relaid, and 736 house connexions with the mains were made, bringing the total of the latter at the end of the year up to 17,634. It is reported that the expenditure during the last five years on Tansa and other waterworks, sewerage, minor sanitary improvements, drainage, roads and markets, has been Rs. 1,63,47,505.

In the other municipalities of the Presidency, considerable expenditure was incurred on conservancy, water-supply, drainage, and minor sanitary improvements. Among the more important works which were executed, taken in hand, or under consideration during the year, were the following:—Water-supply schemes for Ahmedabad, Viramgam, and Panvel were under consideration, and at Dhulia works were in progress for bringing water to the city from a tank at a distance of about seven miles. The municipality of Poona sanctioned the construction of filter works at a cost of Rs. 2,00,000 for securing a supply of pure water for the city. A drainage scheme for Poona was also approved by the municipality. At Dholka Rs. 6,450 were expended on the construction of a drain for relieving the low-lying lands, and at Sukkur city, drainage works, with flushing and ventilating arrangements, were completed.

Berar.

No important sanitary works were undertaken by any of the municipalities in Berar during 1890, but an elaborate scheme was drawn up for the water-supply of Akola, and a project for the drainage of Amraoti was under consideration. The municipalities spent Rs. 103,183 or 45·4 per cent. of their income on sanitary works, and nearly half of this expenditure was devoted to conservancy. In the districts outside municipal limits, Rs. 1,19,621 were spent on sanitary improvements. The total expenditure of the Public Works Department on sanitary works was Rs. 1,50,924. Of this amount, Rs. 28,655 were spent on the construction of the Bhir dam at Chikalda, Rs. 16,399 on the laying of concrete drains in the town of Murtazapur, Rs. 32,204 on the extension of the Amraoti City waterworks, and Rs. 34,918 on the Buldana water-supply. By the system of conservancy adopted in the municipalities, the night soil is trenched, "but the trenched land," the Sanitary Commissioner observes, "is not cropped as has been repeatedly advised." "This is," the Army Sanitary Commission state, "a serious omission which ought to be made good, "not only because money might thereby be raised for municipal purposes, but also "because the trench system, without after cultivation, is altogether incomplete. The "prejudices of the people are against the use of such manure, but so they were, more "or less, all over India. In some parts, however, by persistent effort, these prejudices "have been overcome, with great advantages both to conservancy and municipal "funds." A Sanitary Board has been created in Berar for each district, with subordinate local boards for each village not being a municipality. The village boards are required to supervise the working of a code of village sanitation rules laid down by the Resident, and already satisfactory results have been attained. The enforcing of these rules secures surface cleanliness of village sites, the removal of manure heaps to the outskirts, the prohibition of people answering the calls of nature within the boundaries demarcated by posts, and the protection of existing wells from contamination where necessary.

Military.

Bengal. The total expenditure on military sanitary works in the Bengal Command during 1890–91 amounted to Rs. 91,02,988, exceeding the expenditure of the previous year by Rs. 30,28,786. At several stations satisfactory work was done in the construction and improvement of buildings for the accommodation of the troops. At Rawalpindi, the sudder and cantonment water-supply scheme was in progress, and the preliminary survey for the water-supply for Murree was finished.

Madras. In the Madras Command no sanitary projects of any great importance were in hand. The work of the year was chiefly of a minor character, consisting for the most part in the provision of extra accommodation for the troops and in repairing roads and buildings.

Bombay. In the Bombay Command various improvements were carried out, having for their object the health and comfort of the troops. The new hospital at Satara was completed at a total cost of Rs. 17,970. A scheme was prepared for extending the water-supply from the city of Satara to the Military cantonment and Sadr Bazaar at a cost of Rs. 51,970, towards which provision to the extent of Rs. 35,600 was made for the works in the budget estimate of the ensuing year. The question of the best means of ensuring a permanent and sufficient water-supply to the troops at Ahmedabad was under consideration, but no definite conclusion was arrived at.

India Office,
7th September 1892.

W. T. Ronson.

ABSTRACTS

OF

SANITARY AND OTHER REPORTS

FOR

1890.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA.

(Surgeon-General W. R. Rice, M.D.)

European Troops.

The sickness of the European army of India was, according to the following table, greater in 1890 than in the previous year, though the mortality was much reduced. This peculiarity was due to the intervention of influenza in an otherwise healthy year. Sickness and mortality in 1890.

Abstract of Statistics of European Troops in India for the last 11 *years,* 1880 *to* 1890, *and for the ten-year period* 1870–79.

Year.	Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
1870–79	577,416	1,475	60	19·34	43	62
1880*	51,796	1,789	74	24·85	26†	51†
1881†	58,728	1,605	70	16·86	38	55
1882	57,269	1,445	66	12·07	33‡	45
1883	55,525	1,336	63	10·88	33	44
1884	54,996	1513	67	12·56	32	44
1885§	56,967	1,583	71	14·55	23	37
1886§	61,015	1,514	75	15·18	21	36
1887§	63,515	1,370	70	14·20	23	37
1888‖	68,887	1,382	71	14·84	23	38
1889	69,266	1,498	86	16·60	26	43
1890	67,823	1,520	87	13·84	25	39

* Excluding troops serving in Afghanistan. † Including troops in Afghanistan.
‡ Calculated on the strength obtained from Annual Returns. § Excluding troops on active service in Burma.
‖ Excluding troops in Burma for the first three months of the year.

The chief causes of admission were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission rates were influenza (33 per 1,000 against 0), pneumonia (4·6 per 1,000 against 2·6), other respiratory diseases (35 per 1,000 against 29), ague (354 per 1,000 against 334), and venereal diseases (504 per 1,000 against 482). On the other hand, the admission rates from most of the chief diseases, such as cholera, the severer fevers, bowel complaints and hepatitis, were lessened. Venereal diseases caused 33 per cent. of the total sickness, and ague 23 per cent.

The chief causes of mortality were enteric fever, hepatic abscess, and pneumonia. Among diseases with increased mortality were pneumonia (·90 per 1,000 against ·46), and other respiratory diseases (·28 per 1,000 against ·10). On the other hand, mortality from nearly all the chief diseases, such as cholera, enteric fever, malarial fevers, bowel complaints, hepatitis, circulatory diseases, and phthisis, was lessened. Enteric fever caused 36 per cent. of the total deaths, against 37 per cent. in the preceding year.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, tubercle of the lungs, malarial affections, hepatic inflammation and abscess, palpitation, mental disorders, valvular disease of the heart, and injuries.

In the European army of Bengal the admission, constantly sick and invaliding ratios were increased, while the death-rate was diminished; influenza making itself more felt in the way of sickness than in the way of death. Cholera mortality, though somewhat increased, was comparatively low.

European Army of Bengal.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870-79 - -	363,431	1,522	61	4·18	16·82	21·00	41	62
1880* - - -	31,583	1,813	75	4·84	22·89	27·73	22†	50†
1881* - - -	35,901	1,729	72	3·23	13·82	17·05	37†	54†
1882 - - -	35,164	1,579	69	1·28	11·89	13·17	35	48
1883 - - -	34,079	1,463	66	0·94	10·27	11·21	31	42
1884 - - -	33,486	1,662	70	1·34	10·34	11·68	32	44
1885 - - -	35,031	1,631	73	1·17	11·99	13·16	20	33
1886 - - -	38,784	1,559	73	0·64	14·88	15·52	18	34
1887 - - -	40,601	1,426	69	2·27	12·56	14·83	19	33
1888‡ - - -	42,858	1,398	71	2·10	13·57	15·47	20	36
1889 - - -	42,821	1,517	87	0·84	15·23	16·07	24	40
1890 - - -	41,353	1,584	89	0·99	14·51	15·50	25	41

* Excluding troops in Afghanistan. † Including troops in Afghanistan.
‡ Excluding troops in Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission-rates were ague (400 per 1,000 against 326), venereal diseases (504 per 1,000 against 491), influenza (32 per 1,000 against 0), pneumonia (5·9 per 1,000 against 3·2), and other respiratory diseases (40 per 1,000 against 35). On the other hand, the admission-rates from small-pox, remittent fever, phthisis, diarrhœa, and enteric fever were lessened. Venereal diseases caused 32 per cent. of the total sickness, and ague 25 per cent.

The chief causes of mortality were enteric fever, pneumonia, and hepatic abscess. Among the diseases with increased mortality were especially pneumonia and other respiratory diseases. On the other hand, mortality from heatstroke, fevers, diarrhœa, and hepatitis, was lessened. Enteric fever caused 40 per cent. of the total deaths against 42 per cent. in the preceding year, and pneumonia 8 per cent. against 3.

The chief causes of invaliding were, in order, debility, venereal diseases, tubercle of the lungs, malarial affections, palpitation, hepatic inflammation and abscess, valvular diseases of the heart, mental disorders, and injuries.

The health of the European army of Madras, as may be seen from the following table, was better than in 1889. The admission, death, and invaliding ratios were all diminished, and the constantly sick rate only slightly increased. Cholera mortality was much lessened:—

European Army of Madras.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870-79 - -	110,396	1,264	60	1·68	16·01	17·69	49	67
1880 - - -	10,310	1,368	64	0·10	10·08	10·18	20	30
1881 - - -	10,391	1,160	60	1·73	9·24	10·97	28	39
1882 - - -	11,020	1,058	57	0·82	9·43	10·25	24	34
1883 - - -	10,498	1,013	59	0·95	9·24	10·19	33	43
1884 - - -	10,785	1,109	57	0·93	7·60	8·53	32	40
1885* - - -	10,519	1,154	66	0·19	8·94	9·13	24	33
1886* - - -	11,181	1,380	82	0·09	16·37	16·46	24	40
1887* - - -	11,725	1,250	77	0·60	12·36	12·96	31	44
1888† - - -	14,147	1,341	77	2·83	12·72	15·55	28	43
1889 - - -	13,619	1,507	90	1·84	18·21	20·05	30	50
1890 - - -	13,707	1,442	91	0·07	12·77	12·84	23	36

* Excluding troops on active service in Burma.
† Excluding troops in Upper Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, simple continued fever, and influenza. Among the diseases with increased admission-rates were venereal diseases (491 per 1,000 against 452), influenza (52 per 1,000 against 0), pneumonia (2·6 per 1,000 against 1·4), and other respiratory diseases (27 per 1,000 against 18). On the other hand, the admission-rates from cholera, small-pox, simple continued fever, diarrhœa, and hepatic inflammation and abscess, were lessened. Venereal diseases caused 34 per cent. of the total sickness, and ague 19 per cent.

The chief causes of mortality were enteric fever, heatstroke, remittent fever, dysentery and hepatic abscess. Among the diseases with increased mortality were valve disease and aneurism, respiratory diseases other than pneumonia, and suicide. On the other hand, mortality from cholera, small-pox, other circulatory diseases, enteric fever, malarial fevers, heatstroke, bowel complaints, and hepatitis, was lessened. Enteric fever caused about 28 per cent. of the total deaths, against 22 per cent. in the previous year.

The chief causes of invaliding were, in order, venereal diseases, debility, malarial affections, and hepatic inflammation and abscess.

All the ratios, except that of the invaliding, shown in the following table for the European army of Bombay, were lower than in the preceding year, and would doubtless have fallen still more, had it not been for the occurrence of influenza.

European Army of Bombay.

Period.	Average Strength.	Average Annual Ratio per 1,000.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	103,587	1,533	57	1·53	13·74	15·27	43	58
1880	9,903	2,150	78	—	30·90	30·90	49	80
1881*	9,895	1,784	72	0·30	13·14	13·44	53†	67‡
1882	11,085	1,405	61	0·63	9·74	10·37	36	46
1883	10,948	1,249	57	0·82	9·68	10·50	38	48
1884	10,725	1,455	65	4·85	14·54	19·39	31	51
1885	11,417	1,489	68	6·92	16·90	23·82	29	53
1886	11,050	1,490	73	0·36	12·31	12·67	28	41
1887	11,188	1,292	67	2·50	10·73	13·23	28	41
1888‡	11,882	1,372	67	0·59	11·11	11·70	25	37
1889	12,826	1,425	78	1·33	13·41	14·74	27	42
1890	12,763	1,396	77	0·55	9·01	9·56	29	38

* Excluding troops in Afghanistan. † Including troops in Afghanistan.
‡ Excluding troops in Burma for the first three months of the year.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission-ratios were venereal diseases (516 per 1,000 against 481), influenza (19·4 per 1,000 against 0), pneumonia (2·8 per 1,000 against 1·8), and other respiratory diseases, (30 per 1,000 against 20). On the other hand the admission-ratios from cholera, small-pox, enteric fever, malarial fevers, bowel complaints, and hepatitis were lessened. Venereal diseases caused 37 per cent. of the total sickness, and ague 21 per cent.

The chief causes of mortality were enteric fever, phthisis, heatstroke, and hepatic abscess. Among the diseases with increased mortality were phthisis, and respiratory diseases other than pneumonia. On the other hand mortality from cholera, enteric fever, small-pox, remittent fever, heatstroke, dysentery, and pneumonia was lessened. Enteric fever caused 20 per cent. of the total deaths, against 40 per cent. in the previous year.

The chief causes of invaliding were, in order, debility, venereal diseases, hepatic inflammation and abscess, tubercle of the lungs, injuries, malarial affections, and palpitation.

The vital statistics of the troops serving in the Quetta district are incorporated in those of the Bengal Presidency; but as the command is both important and comparatively new, they are discussed here separately also. While the constantly sick

ratio remained the same as in 1889, admission and mortality were both lowered, and there were no deaths from cholera.

Period.	Average Strength.	Ratio per 1,000.				
		Admissions.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1884	1,441	2,056	82	27·07	41·63	68·70
1885	1,672	2,187	94	42·46	40·67	83·13
1886	1,752	2,442	73	20·57	19·41	19·98
1887	1,932	1,374	52	1·03	10·35	11·38
1888	2,223	1,140	59	—	13·50	13·50
1889	2,210	1,152	58	0·90	9·05	9·95
1890	2,019	1,099	58	—	9·41	9·41

The chief forms of sickness were venereal diseases, ague, injuries, respiratory diseases, tonsillitis and sore throat, and diseases of the integuments. Among the diseases with increased admission-ratios were influenza, dysentery, hepatic abscess, pneumonia, tonsillitis and sore throat, phthisis, rheumatism, venereal diseases, and enteric fever. On the other hand, the admission-ratios from simple continued fever, entozoa, ague, and diarrhœa, were lessened. Venereal diseases caused 24 per cent. of the total sickness, ague 21 per cent. and respiratory diseases 8 per cent.

The chief causes of mortality were enteric fever and hepatic abscess. The chief increase was in hepatic abscess, and the chief decrease in enteric fever. Enteric fever caused 26 per cent. of the total deaths, and hepatic abscess 21 per cent., against 46 per cent., and 9 per cent. respectively in the previous year.

The vital statistics of the troops serving in Burma are included in those of the Madras army; but, as the command is important and in great part new, they are reviewed here separately. The constantly sick rate rose to a high point, while, on the other hand, the admission and death-rates were considerably reduced. The rise in the constantly sick ratio was probably due to the number of men of the Chin-Lushai expedition remaining sick in the beginning of the year. There were no deaths from cholera in 1890.

European Troops in Burma.

Year.	Average Strength.	Average Annual Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1888*	4,061	1,681	87	9·60	22·90	32·50
1889	4,825	1,903	92	2·49	26·73	29·22
1890	4,712	1,743	102	—	20·80	20·80

* Excluding men on active service for the first three months of the year.

The chief forms of sickness were ague, venereal diseases, injuries, diseases of the integuments, dysentery, and influenza. Among the diseases with increased admission-ratios were influenza, enteric fever, venereal diseases, and pneumonia and other respiratory diseases. On the other hand, the admission-ratios from cholera, small-pox, ague, diarrhœa, and hepatitis, were lessened. Ague caused 31 per cent. of the total sickness, and venereal diseases 29 per cent.

The chief causes of mortality were enteric fever, remittent fever, heatstroke, dysentery, hepatic abscess, violence, and ague. Among the diseases with increased mortality enteric fever was pre-eminent. On the other hand, mortality from cholera, small-pox, circulatory diseases other than valve disease and aneurism, violence and injuries, heatstroke, abscess of the liver, and hepatitis, was lessened. Enteric fever caused 29 per cent. of the total deaths, and remittent fever 14 per cent.

The following two tables, again, for 1890, compare the health of the troops in Upper Burma with that of those in Lower Burma :—

European Troops in Upper Burma and Lower Burma for 1890.

	Average Strength.	Average Annual Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
Upper Burma *	2,297	1,894	103	—	17·41	17·41
Lower Burma *†	2,164	1,418	93	—	18·48	18·48

* Excluding expeditionary forces and troops marching. † Including Port Blair.

Statement showing the diseases which have been the chief causes of mortality during 1890.

	Died per 1,000 of Average Strength.								
	Cholera.	Enteric Fever.	Remittent Fever.	Dysentery.	Diarrhœa.	Abscess of Liver.	Pneumonia.	Phthisis Pulmonalis.	All Causes.
Upper Burma	—	3·05	1·31	·87	—	1·31	·87	1·31	17·41
Lower Burma	—	9·24	·92	·92	—	1·85	—	·46	18·84

The troops in Lower Burma were more healthy than those in Upper Burma although their mortality was slightly higher.

The statistics of Gnathong, in Sikkim, of which the following is a summary, are for the period, March to December inclusive, the returns of the first two months of the year belonging to the Sikkim Field Force :—

Period.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1890	78	1,782	64	—	38·46	38·46

As the station is a newly occupied one, and in an unusual situation, the following description of it by Surgeon Russell is here quoted :—" Gnathong is situated at an " elevation of 12,030 feet above the sea-level on the eastern frontier of Sikkim. The " climate during the winter months is very good but cold, the minimum temperature " at night ranging between 9° F. and 25° F. during the months of December, January, " and February. In the day-time during these months there is bright sunshine, and " the thermometer goes up from 50° F. to 60° F. in the shade. This year, which, I " am informed, is unusually severe, there was a fall of snow in the end of October; " and the troops, who had just arrived from the plains, suffered severely from the " cold. The regular snow-fall begins in the middle of January, and usually lasts till " May. The rainy season begins in May, and lasts till October. The rainfall this " year was 188·32 inches. During the rainy season the temperature ranges between " 70° F. and 38° F. The atmosphere is very damp, there being hardly ever more than " one or two degrees between the wet and dry bulb thermometers. The climate " appears to agree with healthy men, but men suffering from heart or lung disease do " not do well, as the great elevation causes much distress in breathing. On first " arrival at the station men suffer from headache and dyspnœa, which, however, " soon passes off. The men are accommodated in wooden huts. The health of the " troops has been good, especially during the cold dry season. On arrival of the

"company of the Connaught Rangers from Dinapore in the month of March, they "suffered to some extent from chest affections, probably caused by wet and cold, "the snow being in a melting condition at the time. Subsequently they enjoyed "good health. Shortly after the arrival of the Liverpool Regiment from Fyzabad "in the month of October two men died, one of acute pneumonia, and the other of "hepatitis. The first case appears to have been caused by exposure to the cold, and "the fact that the men were not sufficiently clothed, and had arrived very recently "from the hot weather of the plains. One man died from exposure to the cold while "drunk."

Some of the more important causes of admission into hospital in the three Presidencies are shown in the following table in the direct order of their ratios :—

Admitted per 1,000 *of strength.*

BENGAL.	1890.	1889.	1870 to 1879.	MADRAS.	1890.	1889.	1870 to 1879.	BOMBAY.	1890.	1889.	1870 to 1879.
Venereal diseases	504	491	209	Venereal diseases	491	452	198	Venereal diseases	515	481	191
Ague	400	326	425	Ague	277	364	140	Ague	288	331	52
Simple continued fever	67	59	*	Simple continued fever	55	82	†	Simple continued fever	57	65	‡
Respiratory diseases	45	39	63	Influenza	52	—	—	Respiratory diseases	33	22	45
Rheumatism and neuralgia.	37	36	62	Rheumatism and neuralgia.	46	34	46	Rheumatism and neuralgia.	32	27	49
Diarrhœa	33	37	62	Dysentery	44	46	77	Diarrhœa	31	32	61
Influenza	31	—	—	Respiratory diseases	30	19	44	Dysentery	20	21	28
Dysentery	27	27	33	Hepatitis	28	33	67	Influenza	19	—	—
Enteric fever	24	26	5	Diarrhœa	17	40	65	Hepatitis	18	21	41
Hepatitis	20	23	47	Remittent fever	10	8	†	Enteric fever	10	20	3
Remittent fever	9	11	*	Enteric fever	9	16	4	Phthisis pulmonalis	5	4	8
Phthisis pulmonalis	4	5	8	Phthisis pulmonalis	4	3	9	Remittent fever	5	8	‡
Spleen diseases	3	3	7	Spleen diseases	2	2	2	Spleen diseases	2	2	6
TOTAL FROM ALL CAUSES	1,584	1,517	1,522	TOTAL FROM ALL CAUSES	1,442	1,507	1,264	TOTAL FROM ALL CAUSES	1,396	1,425	1,533

* Fevers, remittent and simple continued = 182. † Fevers, remittent and simple continued = 126.
‡ Fevers, remittent and simple continued = 131.

In all three Presidencies venereal diseases head the list, show higher ratios than in the previous year, and show much higher ratios than in the decennium. Ague comes next, but in the decennium its ratio was in the case of Bengal and Bombay much higher than that of venereal diseases. Bengal had the highest ratios from ague, simple continued fever, respiratory diseases, diarrhœa, enteric fever, and spleen diseases; Madras the highest from rheumatism and neuralgia, influenza, dysentery, hepatitis and remittent fever; Bombay the highest from venereal diseases and phthisis.

Some of the more important causes of death in the three Presidencies are shown in the following table :—

Deaths from the Chief Diseases and from all Causes in the three Presidencies per 1,000 *of strength.*

Deaths from	BENGAL. 1890.	1889.	1870-79.	Deaths from	MADRAS. 1890.	1889.	1870-79.	Deaths from	BOMBAY. 1890.	1889.	1870-79.
Enteric fever	6·26	6·68	2·28	Enteric fever	3·65	4·48	1·42	Enteric fever	1·88	5·93	1·75
Pneumonia	1·23	·49	1·25	Hepatic: Abscess	·95	1·47	3·16	Hepatic: Abscess	·71	1·09	1·71
Other respiratory diseases	·24	·09		Hepatic: Congestion and inflammation	·22	·81		Hepatic: Congestion and inflammation	·24	—	
Hepatic: Abscess	1·18	1·21	2·04	Remittent fever	1·02	1·32	·62*	Phthisis pulmonalis	·86	·47	1·09
Hepatic: Congestion and inflammation	·02	·05		Dysentery	·95	1·40	2·32	Pneumonia	·47	·55	·70
Cholera	·99	·84	4·18	Phthisis pulmonalis	·58	·59	1·18	Other respiratory diseases	·39	·16	
Dysentery	·73	·63	1·37	Pneumonia	·29	·29	·32	Cholera	·55	1·33	1·53
Phthisis pulmonalis	·58	·89	1·20	Other respiratory diseases	·29	·07		Dysentery	·55	·78	·98
Remittent fever	·34	·35	1·74*	Cholera	·07	1·84	1·68	Remittent fever	·31	·62	1·14*
Diarrhœa	·05	·09	·12	Diarrhœa	—	·15	·04	Diarrhœa	·08	—	·17
TOTAL FROM ALL CAUSES	15·50	16·07	21·00	TOTAL FROM ALL CAUSES	12·84	20·05	17·69	TOTAL FROM ALL CAUSES	9·56	14·74	15·27

* Including ague and simple continued fever.

In Bengal and Bombay enteric fever heads the list for all three periods; but in Madras hepatitis, dysentery, and cholera were higher in the decennium. Bengal had the highest death-rates from enteric fever, pneumonia, hepatitis, and cholera; Madras the highest from dysentery and remittent fever; Bombay the highest from respiratory diseases other than pneumonia, phthisis, and diarrhœa. Mortality from enteric fever decreased in all three Presidencies, but especially in Bombay. The percentage respectively of enteric fever, hepatitis, dysentery, and pneumonia in the total deaths of each Presidency was:—

1890.

	Bengal.	Madras.	Bombay.
Enteric fever	40·4	28·4	19·7
Hepatitis	7·8	9·1	9·9
Dysentery	4·7	7·4	5·7
Pneumonia	8·0	2·3	4·9

Bengal was highest in enteric fever and pneumomia; Madras in dysentery; and Bombay in hepatitis.

The following statement shows the admission and death-rates for a series of years in the several geographical groups of stations occupied by the European army of Bengal:—

Period.	Ratio per 1,000 of strength.															
	1 Bengal Proper.		2 Gangetic Provinces and Oudh.		3 Meerut and Rohilkhand.		4 Agra and Central India.		5 Punjab.		6 Quetta District.		7 Hill Stations.		Bengal Presidency.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1860–69	1,821	29·87	1,615	28·59	1,576	26·61	2,169	38·48	1,741	25·24	—	—	1,069	14·78	1,755	29·98
1870–79	1,311	14·43	1,410	20·06	1,461	18·31	1,530	18·41	1,847	20·71	—	—	1,044	12·23	1,522	21·00
1880*	1,469	16·03	1,494	29·32	2,091	22·98	1,935	15·07	2,126	36·41	—	—	1,253	20·75	1,513	27·73
1881*	1,610	12·02	1,741	15·94	1,867	17·31	1,728	10·11	1,949	23·44	—	—	1,177	9·97	1,729	17·05
1882	1,187	11·19	1,699	22·61	1,613	8·86	1,891	10·51	1,796	12·12	—	—	975	8·65	1,579	13·17
1883	1,011	9·19	1,474	17·04	1,528	10·56	1,497	14·27	1,601	9·47	—	—	1,454	6·33	1,463	11·21
1884	1,195	10·07	1,381	14·72	2,028	17·01	1,874	15·53	1,992	9·75	—	—	1,201	5·91	1,662	11·63
1885	1,449	13·09	1,539	15·23	2,463	18·00	1,687	10·98	1,566	12·67	—	—	1,395	9·50	1,661	13·16
1886	1,675	15·46	1,630	17·09	1,902	16·68	1,526	15·91	1,442	16·64	2,850	19·58	1,219	10·27	1,559	15·52
1887	1,617	14·17	1,437	19·01	1,750	14·31	1,696	20·03	1,375	13·63	1,874	11·33	1,112	12·42	1,426	14·83
1888	1,621	16·05	1,382	15·01	1,682	11·89	1,748	17·61	1,421	16·25	1,140	13·50	1,255	14·86	1,398	15·47
1889	1,465	13·29	1,524	17·32	1,653	18·73	1,869	21·72	1,678	18·51	1,152	9·95	1,172	9·76	1,517	16·07
1890	1,985	8·80	1,620	17·59	1,753	22·50	1,972	16·37	1,651	15·01	1,099	9·41	1,317	13·46	1,584	15·50

* Excluding troops in Afghanistan and on the march.

The admission ratios of the first, second, third, fourth, and fifth groups were above the presidential ratio of the year. Comparing the group ratios of 1890 with the corresponding ratios of 1889, 1870–79, and 1860–69, it will be seen that the ratios of the first, third, and seventh groups were worst, while those of the fifth were best. Bengal Proper had the highest ratios from simple continued fever, dysentery, hepatic abscess, entozoa, and diseases of the integuments, as well as from all causes taken together; the Gangetic Provinces the highest from influenza, cholera, remittent fever, congestion, and non-suppurative inflammation of the liver and venereal diseases; Meerut and Rohilkhand the highest from small-pox and enteric fever; Agra and Central India the highest from ague and heat-stroke; the Punjab the highest from spleen diseases and pneumonia; the Hill Stations the highest from diarrhœa, scurvy, and rheumatism; and the Quetta district the highest from respiratory diseases other than pneumonia (it had the second highest ratio from pneumonia), tonsillitis, and phthisis.

The death ratios of the second, third, and fourth groups were above the presidential ratio of the year. Comparing the group ratios of 1890 with the corresponding ratios of 1889, 1870–79, and 1860–69, it will be seen that those of Meerut and

Rohilkhand and of the Hill Stations were the worst. The ratios of all the groups were lower than the corresponding rates of 1860–69, lower than those of 1870–79, except in the case of the third and seventh groups, and lower than the corresponding rates of 1889, except in the case of the second, third, and seventh groups.

The following statement shows the admission and death-rates in the several geographical groups of stations occupied by the European armies of Madras and Bombay:—

Period.	Ratio per 1,000 of strength.													
	1 Rajputana, Malwa, Sind, and Aden.		2 Deccan and Nagpur.		3 Southern India.		4 Burma.		5 Hill Stations and Hill Convalescent Depôts.		Bombay Presidency.		Madras Presidency.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1870-79	1,614	17·41	1,383	14·14	1,235	13·70	1,092	17·32	1,594	15·16	1,533	15·27	1,264	17·69
1888	1,468	13·34	1,232	9·19	1,323	9·00	1,681	32·50	1,224	4·10	1,372	11·70	1,341	15·55
1889	1,577	20·47	1,286	14·20	1,361	10·17	1,903	29·22	1,304	5·83	1,425	14·74	1,507	20·05
1890	1,466	10·45	1,250	7·36	1,440	9·73	1,743	20·80	1,427	9·21	1,396	9·56	1,442	12·84

As in the previous year, the admission ratios of the first and fourth groups were above the presidential ratios of the year. Comparing the group ratios of 1890 with the corresponding ratios of 1889 and of 1870–79, it will be seen that that of Southern India was the worst. The first group had the highest ratios from cholera, enteric fever, diarrhœa, tonsillitis, and scurvy; the second group the highest from venereal diseases; the third group the highest from simple continued fever, pneumonia, and entozoa; the fourth group (Burma) the highest from influenza, ague, remittent fever, dysentery, and from all causes taken together.

Principal diseases: Influenza.

In 1890 India shared in the pandemic of influenza. This disease first showed itself epidemically in Russia in September–October 1889, and from thence spread over Europe, reaching its height there in December. The first cases in Egypt were noticed (Kartulis) in the last half of December. In India a few cases are returned as influenza every year, and in 1889 the cases so returned amounted to 5 among European troops, 7 among Native troops, and 33 among prisoners, the last item representing a curious isolated outbreak in August 1889 among the prisoners of the Thayetmyo Jail, regarding which the medical officer wrote:—"Not only were the prisoners affected "by it, but members of the jail-guard and jail establishment suffered equally "from it."

In Bombay and Calcutta cases in 1890 are said to have been first noticed early in February, the Health Officer of Calcutta saying the disease was imported from Bombay; in Rangoon and probably in Madras, in the middle of March; but the Sanitary Commissioner, North-Western Provinces and Oudh, states that influenza was epidemic in the Jalaun district from the middle of January, and in the Bijnor district from February.

The disease in 1890 began to be epidemic among the European troops in March, and reached its height in April, after which it rapidly declined, there being few cases in the second half of the year. Its invasion of India was not associated with any very markedly peculiar meteorological conditions; January and February were dry, March damper, March and April unsettled; and in all four months the barometer was low. The following summary has been kindly furnished by the Meteorological Department:—

Barometer.—January, low; February, not so low, but still below normal, except Central stations; March, low; April, as February; May, low.

Humidity.—Air very dry January and February; damper March; variations small April, but excess along Himalayas and parts peninsula; air drier again May; damper June-July, but with general rain; drier September.

Weather.—Weather very fine January and February (though *slightly* more unsettled February than January); very unsettled March, with frequent periods moderate rain; Latter half April also unsettled, numerous thunderstorms; May less unsettled than usual; June, monsoon began early, rain general.

Temperature.—January, high northern, slightly low southern India; February, high generally; March, high southern, low northern India; April, variations small, irregular; May, high, except Burma and west coast; June and July, low.

Distribution of Influenza in the year seems to have been associated with high humidity and unsettled weather in March–April, but with dry weather in May. Rain and high humidity together no effect apparently.

Though in some stations the epidemic exploded, as it were, in others the onset was so stealthy that the presence of an epidemic was not realised until many of the first cases had already been returned as simple continued fever, ague, bronchitis, pneumonia, &c. This and the absence of information as to the exact time of incidence on the various centres of native population make it difficult to trace the course of the disease chronologically in the several garrisons. The first European garrisons to *return* cases were Jubbulpore (week ending 28th February), Lucknow, Umballa, and Mhow (week ending 7th March); and the last those of Burma, viz., Rangoon, Thayetmyo (week ending 9th May), Mandalay (week ending 6th June), Bernardmyo (week ending 8th August); but influenza was present in Rangoon in the general population from the middle of March. Out of the 110 European garrisons and cantonments in India-Burma, 52, or 47 per cent., returned no influenza. In some of these there occurred a rise in fevers and respiratory diseases at the time when influenza was present in other stations, a fact suggesting perhaps a failure of diagnosis; but in the case of others of them the exemption was genuine. As to whether the epidemic took its own course, or was spread only by human means, or was at least aided in its extension by the intercourse of men, it is as difficult to say in India as it was in Europe.

Cholera.

The amount of cholera was much less than in the previous year. There were only 58 admissions against 103, and 49 deaths against 78. The permillage of admissions to strength was 0·9, and of deaths 0·72, and the percentage of deaths to cases 84·48. The corresponding figures of 1889 were 1·5, 1·13, and 75·00; and of the decennium 1870–79, 4·7, 3·22, and 69·11. About 59 per cent. of the whole number of cases occurred in the months of July, August, and September, the maximum being in September.

The ratios of morbidity, mortality, and fatality in the Bengal Army were respectively 1·2, 0·99, and 82·00, against 1·1, 0·84 and 75·00 in 1889, and against 5·9, 4·18, and 70·26 in the decennium 1870–79. Of the total 50 cases, 84 per cent. occurred in June–October, the maximum being in September. The station most severely visited was Lucknow, where there were 18 cases with 13 deaths in August–October.

There was only one case of cholera in the Madras Army, at Madras in August, and it was a fatal case.

The morbidity ratio of the Bombay Army fell from 2·0 to 0·5, the mortality ratio from 1·33 to 0·55; while the fatality ratio was 100·00 against 65·38 in 1889, and 73·27 in 1870–79. Four of the 7 cases occurred in April, three of them at Mhow. The only other stations affected were Indore and Nasirabad.

Small-pox.

Small-pox was much less prevalent. There were 36 admissions (0·5 per 1,000) and 4 deaths (0·06 per 1,000) against 153 (2·2 per 1,000) and 17 (0·25 per 1,000) in 1889. All three Presidencies participated in the reduction.

Fevers.

Ague gave rise to about 23 per cent. of the admissions from all causes in the army of India. The admission rate (354 per 1,000) was nearly 20 per 1,000 higher than in the previous year. This was altogether due to a rise in Bengal, for in the other two Presidencies the admission rate was actually diminished. The death-rate was increased only in Bombay, but the death-rate of Madras was the highest, principally from deaths in Burma.

The most malarious groups were Agra and Central India, Bengal Proper, and Burma, the highest mortality being in Burma; and the least malarious the Deccan and Nagpur, the Hills, and the Gangetic Provinces. Ague was most prevalent in Agra and Central India, and remittent fever in Burma.

The admission and death ratios from remittent fever fell respectively from 10·0 and 0·59 to 8·1 and 0·47. In sickness the decrease was in Bengal and Bombay, in mortality in all three Presidencies. Among groups the highest admission ratios were those of Burma (25·9 against 22·4 in 1889), the Gangetic Provinces, Quetta, and Agra and Central India (16·4 against 46·6 in 1889).

For India the admission and death ratios from simple continued fever (62·5 and 0·1) were slightly reduced. No deaths were returned under this head from the Bengal and Bombay Armies, and only 1 from the Madras Army.

Enteric fever.

Among medical officers the opinion gains ground that the enteric fever of India, however masked its clinical features may sometimes be by Indian climatic peculiarities, is essentially the same in pathology as the corresponding fever of Europe.

Specimens from three more cases occurring in European soldiers in Lucknow and Fyzabad were submitted to Professor Fischer of Kiel. In one he has found the bacillus; but regarding the others he has not yet reported. To him were also sent specimens of spleen and mesenteric glands from the case of a native soldier, who died at Lucknow of a fever diagnosed as enteric. Regarding them, Professor Fischer reports that the specimens did not reach him in good order, and that a careful examination of more than 50 sections failed to demonstrate the presence of the bacillus. Of course in such a case a negative result is not conclusive, as a positive result would have been. But the demonstration of the truth of the assertion, so often made, that the same enteric fever occurs among natives as among Europeans, is still lacking. However likely it may be that enteric fever among European soldiers is generally directly or indirectly derived from cases among natives in the bazaars, nothing more than likelihood can be attained, no proof can be given, until careful and extensive clinical, anatomical, and bacteriological examinations have been made. These investigations can only be carried out in properly equipped institutions; for the individual medical officer, even if acquainted with what has been written and done in Europe, and with the methods to be employed in the investigation, has never at his disposal the necessary combination of leisure and apparatus. To obtain certainty as to the real nature and relationships, as to the unity or diversity, of the anomalous enteric-like febrile cases which so constantly occur, and in view also of the suspicion, not improbably ill-founded, thrown on the *bacterium coli commune* by Professor Macé of Nancy and others, it is obviously important to identify the microphyte or mycrophytes of such Indian fevers by the methods of cultivation. This has not yet been done.

The British cantonments are, as it were, oases of purity amidst a desert of filth, with this peculiarity that the oases are generally alongside the filthiest parts of the desert. But to say, as some do, that the presence of filth alone is enough, and that, given filth, the disease may arise *de novo* is as opposed to the lessons of modern science as would be the assertion that the weeds which spring up in waste places have arisen *de novo* and not from seeds. Notwithstanding the opinion of an observer here and there, it is also the belief of the leading bacteriologists that bacteria breed true, and that to suppose that an ordinary putrefactive microbe can generate an enteric fever bacillus is as reasonable as to expect a cat to give birth to a tiger. It appears, therefore, likely, though not demonstrated, that the enteric fever which affects the European troops is also a disease of the natives of the country. To explain the great comparative immunity of adult natives, as evidenced by the statistics of native troops and prisoners, it has been suggested that natives, in consequence of having lived generation after generation saturated in specific filth, have acquired a certain tolerance or immunity, and have the disease mild and early, just as English children have the measles. But when young men from comparatively pure England are brought to India, they suffer from the disease severely, in something of the same way as the uninured inhabitants of St. Kilda and of the Fiji Islands suffered from the introduction of measles.

Any visible good effects of the sanitary improvements so far effected have been hidden and neutralised by the importation of more susceptible soldiers. It has been proved by experiment on a large scale that purity of cantonments is not enough; there must also be purity in the neighbouring cities and villages. As the attainment of this by great general measures of sanitation, which act by preventing the accidental cultivation and conveyance of the bacillus, must necessarily be a slow and gradual process attended by vast expense, it might be wise in the meantime to endeavour to save life and money by supplying a less susceptible human material for the bacillus to work on.

Hitherto, when a case, diagnosed as enteric fever, has been found on *post mortem* examination to want the anatomical intestinal lesions, it has simply been assumed that the diagnosis had been wrong. But Dr. Justyn Karlinski in Europe has published two carefully studied cases, in which the symptoms were anomalous, and no intestinal lesions were present, and yet the bacillus was found by cultivation from the spleen and other internal organs; and another in which with only an old cicatrix in the intestine,

the bacilli were recovered from the blood by cultivation. This observation, if confirmed, will still more deeply emphasize the need of bacteriological examination of Indian cases.

It is satisfactory to have to note a substantial reduction in morbidity and mortality from enteric fever in 1890. As compared with the corresponding ratios of 1889, the admission (18·5) and death (4·91) ratios for enteric fever decreased respectively by 4·4 and 1·20 per 1,000 of strength.

The following table shows the admission and death-rates for enteric and for intermittent, remittent, and simple continued fevers for a series of years :—

Period.	Bengal.						Madras.						Bombay.					
	Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.		
	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.
1870-79* - -	5·3	607·3	612·6	2·28	1·74	4·02	3·9	266·5	270·4	1·42	0·62	2·04	3·1	659·9	663·0	1·75	1·14	2·89
1880† - - -	8·7	809·6	818·3	3·07	2·66	5·73	2·6	450·1	452·7	1·36	0·39	1·75	9·5	1,117·3	1,126·8	5·76	3·23	8·99
1881† - -	6·3	763 9	770·2	2·62	0·81	3·43	0·9	278·7	279·6	0·58	0·19	0·77	4·2	840·6	844·8	2·83	0·91	3·74
1882 - - - -	7·3	600·0	667·3	2·90	0·77	3·67	4·0	171·5	175·5	2·09	0·27	2·36	5·1	558·5	563·6	1·90	0·81	2·71
1883 - - -	8·1	486·4	494·5	2·52	0·44	2·96	8·6	128·4	137·0	2·86	0·28	3·14	5·7	436·4	442·1	1·55	0·73	2·28
1884 - -	12·6	682·8	695·4	3·31	0·36	3·67	11·4	166·0	177·4	1·67	—	1·67	9·1	504·4	513·5	2·05	2·14	4·19
1885 - - -	14·0	611·0	625·0	4·05	0·60	4·65	6·4	149·4	155·8	2·19	0·19	2·38	7·3	577·5	584·8	2·54	1·49	4·03
1886 - - - -	21·6	490·5	512·1	5·70	0·99	6·69	11·9	259·8	271·7	3·85	0·89	4·74	12·3	472·2	484·5	4·16	0·27	4·43
1887 - -	13·4	449·7	463·1	4·09	0·76	4·85	11·5	203·6	215·1	2·98	0·51	3·49	11·3	372·6	383·9	3·40	0·90	4·30
1888 - -	16·2	427·1	443·3	4·15	0·34	4·49	7·4	302·8	310·2	2·26	2·19	4·45	11·6	425·5	437·1	4·04	0·34	4·38
1889 - -	25:8	396·4	422·2	6·68	0·47	7·15	16·2	453·9	470·1	4·48	1·98	6·46	20·3	404·1	424·4	5·93	0·70	6·63
1890 - - -	24·1	475·5	499·6	6·26	0·39	6·65	9·3	341·8	351·1	3·65	1·67	5·32	10·2	349·0	359·2	1·88	0·39	2·27

* Including troops on active service and on the march. † Excluding troops in Afghanistan.

With regard to both admissions and deaths from enteric fever, Bengal stood highest, Madras lowest in admissions and Bombay in deaths. In both admissions and deaths the ratios of all three Presidencies were higher than the corresponding ratios of the decennium 1870–79, though the Madras death ratio had sunk so low as to be not much higher. On the other hand, all the ratios were lower than those of the previous year, the admission ratios of Madras and Bombay and the death ratio of Bombay being especially reduced. On the whole, the table also shows, especially for admissions, the gradual increase in the diagnosis of enteric fever during the last ten years, and the corresponding diminution in the number of other fevers diagnosed per 1,000 of strength. The increase of non-enteric fevers in the Madras Army during the last five years is due to the new territory of Upper Burma having been placed under that Command. The following table also compares enteric fever with the same other fevers, but in respect of mortality only :—

	During 1870–79.			During 1880–89.			During 1889.			During 1890.		
	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.
Army of India† - -	2·03	1·42	3·45	3·67	0·92	4·59	6·11	0·81	6·92	4·91	0·64	5·55
„ Bengal‡ - -	2·28	1·74	4·02	4·05	0·91	4·96	6·68	0·47	7·15	6·26	0·39	6·65
„ Madras† - -	1·42	0·62	2·04	2·50	0·77	3·27	4·48	1·98	6·46	3·65	1·67	5·32
„ Bombay‡ -	1·75	1·14	2·89	3·45	1·12	4·57	5·93	0·70	6·63	1·88	0·39	2·27

* Intermittent, remittent, and simple continued fevers.

† Excluding troops on active service in Burma during 1885 to 1887.

‡ Excluding troops in Afghanistan during 1881.

It shows that in the last 10 years, and especially of recent years, there has been an increase in total fever mortality, usually ascribed to the greater youthfulness and recent arrival of the soldiers of to-day; and an increase of mortality from enteric fever accompanied by a decrease in mortality from the other fevers, which is probably partly due to increased susceptibility on the part of the army, from youth and recent arrival, and partly due to the greater frequency with which the diagnosis of enteric fever is now made.

In the following table the groups are arranged in the direct order of their admission rates from enteric fever :—

	Average strength.	Number of Cases.	Admissions per 1,000.	Number of Deaths.	Deaths per 1,000.	Percentage of Deaths to Cases.	Percentage of Deaths to Cases in 1870–79.
1. Meerut and Rohilkhand	4,489	188	41·9	50	11·14	22·03	42·63
2. Hill Stations	6,020	190	31·6	45	7·48	23·44	35·07
3. Agra and Central India	3,420	106	31·0	30	8·77	26·79	46·37
4. Quetta District	2,019	45	22·3	5	2·48	10·20	*
5. Gangetic Provinces	7,105	157	22·1	52	7·32	27·96	41·15
6. Punjab	13,128	268	20·4	66	5·03	21·93	48·51
7. Convalescent Depôts	2,040	24	11·8	6	2·94	24·00	*
8. Bengal Proper	2,274	10	4·4	4	1·76	28·57	38·46
BENGAL PRESIDENCY	41,353	996	24·1	259	6·26	23·25	43·39
1. Rajputana, Malwa, Sind, and Aden.	5,551	66	11·9	14	2·52	18·42	60·65
2. Burma	4,712	49	10·4	28	5·94	51·85	34·29
3. Southern India	3,802	39	10·3	11	2·89	26·83	31·22
4. Deccan and Nagpur	9,512	79	8·3	16	1·68	17·78	43·19
5. Hill Stations and Hill Convalescent Depôts.	1,303	7	5·4	5	3·84	71·43	50·00
MADRAS PRESIDENCY	13,707	127	9·3	50	3·65	34·97	36·43
BOMBAY PRESIDENCY	12,763	130	10·2	24	1·88	16·78	56·39
ARMY OF INDIA	67,823	1,253	18·5	333	4·91	23·79	43·83

* Not available.

In Bengal the Meerut and Rohilkhand group retained the pre-eminence which it attained in 1889; the Hill Stations were, as usual, high up; but the Gangetic Provinces were much lower down than usual. In the other Presidencies Malwa retained the pre-eminence, and Burma rose from the lowest place to the second highest. The admission ratios of the Punjab, Gangetic Provinces, Depôts, and Bengal Proper, and the death ratios of the Punjab, Agra, and Central India, Quetta, and the Depôts among the Bengal groups were lowered, the other Bengal ratios being increased. In the case of the Madras-Bombay groups the first and second had very greatly reduced admission and death-rates, and the Hill Stations and Depôts a reduced admission rate, the ratios of the other groups being increased. The maximum death-rate was 11·14 in Meerut and Rohilkhand, and the minimum 1·68 in the Deccan and Nagpur. The highest percentage of fatality was 71 in the Madras-Bombay Hills, and the lowest 10 in the Quetta District. With the here unimportant exceptions of Burma and the Madras-Bombay Hills the fatalities were lower than in the decennium, this being due apparently to the greater number of non-fatal cases now-a-days diagnosed as enteric fever.

The following shows those garrisons of India which had an average strength of over 1,000, arranged in the direct order of their admission ratios from enteric fever :—

ENTERIC FEVER in 1890.

Stations over 1,000 *strong.*

Stations.	Average Annual Strength.	Admission rate per 1,000 of Strength.	Death-rate per 1,000 of Strength.	Died out of each 100 Cases treated.
Bareilly	1,247	78·6	20·05	21·37
Sialkot	1,094	74·0	13·72	16·67
Agra	1,061	42·4	15·08	34·78
Meerut	1,749	36·6	11·44	25·97
Lucknow	2,531	30·0	5·93	14·71
Allahabad	1,065	28·2	11·27	38·71
Rawal Pindi	2,506	25·9	5·19	16·88
Quetta	2,019	22·3	2·48	10·20
Ferozepore	1,031	22·3	9·70	41·67
Mhow	1,493	16·1	4·02	24·00
Bangalore	1,824	14·8	2·74	17·86
Umballa	2,036	13·3	3·93	25·00
Poona	2,078	12·0	·96	8·00
Secunderabad	2,798	5·4	2·14	26·09
Belgaum	1,047	4·8	·96	16·67
Fort William	1,105	3·6	2·72	75·00
Peshawar	1,531	2·6	·65	25·00

The highest admission and death ratios were, as in the previous year, those of Bareilly; but Mhow, which was second in 1889, sank to the tenth place. The lowest rates in the list are those of Peshawar, Fort William and Belgaum; the two latter having been at the bottom of the list also in 1889. The fatality percentage varied between 75 at Fort William and 8 at Poona. 22 stations had no enteric fever. The exemption of Barrackpore is ascribed by the medical officer to the excellent water-supply. In the case of Kuldunnah, the medical officer says that the cases which occurred in 1889 were contracted before arrival, and that the men, being now in their second season in Kuldunnah (Murree Hills), enjoy excellent health.

The following table shows the greater liability of the young soldier to die from enteric fever, and the decreasing liability with advancing age:—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Ages, together with Ratios of Liability to it, for 1889 and 1890.

Year.	Mortality from Enteric Fever and Ratio of Liability to it at Different Ages.					
	24 and under.		25 to 29.		30 to 34.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	9·81	64·50	3·25	21·37	1·83	12·03
1890	7·78	65·93	2·84	24·07	1·18	10·00

Again, the following shows that the recent arrival is more apt to die from enteric fever than he who has been longer in the country, and that with increased service in India the liability to death from enteric fever rapidly diminishes:—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Periods of Residence in India, together with the Ratios of Liability to it, for 1889 and 1890.

Year.	Mortality from Enteric Fever, and Ratio of Liability to it at Different Periods of Residence in India.					
	1st and 2nd Years.		3rd to 5th Year.		6th to 10th Year.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	11·65	57·02	4·20	20·56	2·43	11·89
1890	10·21	66·47	2·98	19·40	2·17	14·13

As in former years, medical officers were usually unable, even to their own satisfaction, to trace out in any given outbreak a definite insanitary condition to which the outbreak might with certainty be attributed. Most medical officers lay stress on the influence of climate acting on young and unseasoned soldiers; many noticing that increase of the disease in a station is connected with the arrival of fresh drafts from the old country, or that a year marked by the non-arrival of such drafts is also characterized by comparative absence of enteric fever. Most medical officers suspect strongly the bazar supplies, especially the bazar drinks, obtained privately by the men; and also impure water drunk casually by soldiers on the march. Out of the 1,253 cases of enteric fever which occurred throughout the European Army of India in 1890, 30 declared themselves among men already in hospital, either as patients or as attendants, and out of the 30, 14 were suffering from venereal disease.

Many of the cases returned as simple continued fever were suspected to have been mild cases of enteric. The finding of rose-spots was very frequently reported both from hill and from plain stations. The presence or absence of albuminuria was hardly ever noted.* As usual certain of the *post mortem* records were scarcely typical of the disease.

Bowel complaints.

The admission rate from dysentery in the Army of India was slightly reduced (from 30 per 1,000 to 29), that from diarrhœa was also reduced (from 36 to 30 per 1,000), as well also the mortality from each (from 0·81 and 0·09 per 1,000 respectively to 0·74 and 0·04).

Dysentery was most prevalent in the Madras Army, least so in the Bombay Army. In Bengal the admission rate (27 per 1,000) was the same as in 1889, but lower than in the two decennia 1860–69 and 1870–79; in Madras it was lower (44 against 46) than in 1889, lower than in the decennium 1870–79, and lower than in any year since 1881. In Bombay it was lower than in 1889 (20 against 21), lower than in the decennium 1870–79, and lower than in any year since 1883. Mortality from dysentery was highest in the Madras Army (0·95), lowest in the Bombay Army (0·55). In Bengal the mortality (0·73) was higher than it had been since 1886, but lower than in either of the decennia; in Madras it was lower (0·95) than it had been since 1887, and lower in than the decennium 1870–79; in Bombay it was lower (0·55) than it had been since 1883, and lower than in the decennium 1870–79.

Diarrhœa was most prevalent in the Bengal Army, least so in the Madras Army. In Bengal the admission rate (33 per 1,000), was lower than in any other year since 1880, and lower than in either of the decennia; in Madras it was less (17) than half that of any year, and still more below that of the decennium 1870–79; in Bombay it was lower (31) than in the decennium 1870–79 and than in any other year. Mortality from diarrhœa was highest in Bombay (0·08), and was altogether wanting in Madras. In Bengal it was lower (0·05) than in the previous year and the decennia; in Bombay it was higher than in the preceding year, but lower than in the decennium 1870–79.

Hepatitis.

There was during the year under review a decrease both in the sickness and in the mortality due to hepatitis. The admission rate (21 per 1,000) had never been lower, and the death-rate (1·15) not since 1885. The ratios of Madras (28 and 1·17 per 1,000 respectively) were, as usual, higher than those of the other Presidencies. Those of Bombay (18 and 0·95) were the lowest. The ratios of Bengal were 20 and 1·20. In all cases the ratios were below those of the decennia.

The percentage of hepatic abscess in the total causes of death was much the same in the three Presidencies, that in Bengal (7·6) being slightly the highest. The mortality per 1,000 of strength from abscess of the liver was highest in Bengal (1·18), lowest in Bombay (0·71), while in Madras the ratio was (0·95).

Respiratory diseases.

That there was a considerable increase in respiratory morbidity and mortality was due to the influenza epidemic. The admission rate rose from 32 to 40 per 1,000, and the death-rate from 0·56 to 1·18. Bengal had the highest admission ratio (45 per 1,000), Madras the lowest (30). In all three Presidencies the ratio was increased, in Bengal by 6 per 1,000 (from 32 to 40), and in each of the others by 11 per 1,000, but in all it remained below the decennial (1870–79) average. Bengal had the highest death ratio (1·47), Madras the lowest (0·58); in Bombay the ratio was 0·86. In all three it was higher than the decennial ratio.

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* Various observers in Europe have found that the bacillus occurs in the urine only when the latter is albuminous.

Venereal disease caused *directly* 33 per cent. of the admissions, 0·7 per cent. of the deaths, and 13·2 per cent. of the invaliding of the Army of India. The admission rate rose about 22 or 23 per 1,000 of strength above that of 1889. All three Presidencies participated in the rise. Venereal disease.

Admissions from Venereal Diseases in the three Presidencies.

Presidency.	Admissions per 1,000.										
	1870–79.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
Bengal - -	209	276*	271	281	291	363	394	356	373	491	504
Madras - -	198	258	288	289	307	350	394	400	376	452	491
Bombay - -	191	261*	224	218	292	272	370	337	357	481	515
India -	203	260	265	270	294	343*	389	361	371	482	504

* Excluding troops in Afghanistan.

In the year 1884 the Contagious Diseases Acts were still in force. The following table compares the venereal statistics of 1884, 1889, and 1890 :—

Army of India.

Venereal Admissions of 1884, 1889, *and* 1890 *compared.*

Venereal Diseases.	1890. Strength 67,823.		1889. Strength 69,266.		1884.* Strength 55,349.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis -	9,198	135·6 } 220·7	9,299	134·3 } 225·1	4,992	90·2
Ulcer of penis -	5,769	85·1 }	6,293	90·9 }		
Secondary syphilis -	4,497	66·3	3,549	51·2	1,352	24·4
Gonorrhœa - -	11,725	172·9 } 216·6	12,334	178·1 } 205·2	8,070	145·8 } 179·0
Other venereal diseases	2,963	43·7 }	1,878	27·1 }	1,835	33·2 }
Total - -	34,152	503·5	33,353	481·5	16,249	293·6

* From Annual Returns.

Regarding only the ratios to the right of the brackets, it appears that all the ratios of 1889 were greater than those of 1884, and all those of 1890, with the exception of that of primary syphilis, greater than those of 1889.

In the Army of Bengal venereal disease caused *directly* 32 per cent. of the admissions, 0·5 per cent. of the deaths, and 9·5 per cent. of the invaliding. The admission rate (504) rose about 13 per 1,000 of strength over that of 1889.

In the Army of Madras venereal disease caused *directly* 34 per cent. of the admissions, 1·7 per cent. of the deaths, and 25·4 per cent. of the invaliding. The admission rate (491) rose about 39 per 1,000 of strength over that of 1889.

In the Army of Bombay venereal disease caused *directly* 37 per cent. of the admissions, 0·8 per cent. of the deaths, and 13·6 per cent. of the invaliding. The admission ratio (515) rose about 34 per 1,000 above that of 1889.

In the whole Army of India 1,715 men were invalided, or 25·29 per 1,000 of average strength, against 1,789 and 25·92 in the preceding year. The ratio for 1890 was about 18 per 1,000 less than that of the decennium 1870–79, which was 43·04. The proportion of invalids to strength was lowest in Madras; it is usually lowest in Bengal. It was highest in Bombay. Invaliding.

Thirty-five per cent. of the total number invalided were discharged as unfit for further service. This proportion, as may be seen from the following table, was not out of the common, though rather lower than usual. Only in Bombay was the proportion of discharge greater than in the previous year, and than usual. The proportion was, as usual of late years, highest in Madras.

Percentage of those invalided for discharge to total number invalided.

—	1886.	1887.	1888.	1889.	1890.
Army of India -	41	37	39	37	35
„ Bengal -	46	41	40	37	33
„ Madras -	42	43	43	46	43
„ Bombay -	28	22	29	25	32

The following table shows the diseases which caused invaliding of not less than 1 per 1,000 of strength :—

Bengal.		Madras.		Bombay.	
Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.
Debility - - -	3·46	Venereal diseases - -	5·33	Debility - - -	5·02
Venereal diseases - -	2·12	Debility - - -	2·48	Venereal diseases - -	3·92
Tubercle of lung - -	1·89	Mental diseases - -	1·81	Mental diseases - -	1·50
Malarial fevers - -	1·81	Malarial fevers - -	1·39	Malarial fevers - -	1·41
Palpitation of heart -	1·69			Tubercle of lung - -	1·33
Valve disease of heart -	1·43			Injuries - - -	1·27
Hepatitis and congestion of liver - - -	1·26			Palpitation of heart - -	1·26
Mental diseases - - -	1·18			Hepatitis and congestion of liver - - -	1·02

Debility and venereal disease head the list in all three Presidencies.

There was an increase in the ratio of invaliding from mental disease in the Army of India from 1·23 in 1889 to 1·36 in 1890. The ratios of Madras (1·81), and Bombay (1·50), were also increased; that of Bengal diminished from 1·39 to 1·18). There were 24 cases of melancholia, 22 of dementia, and 16 of mania.

The percentage of men who were invalided while under 25 years of age to the whole number invalided was 53·04 for the Army of India against 50·06 in the previous year. The percentage of men under 25 in the strength of the Army of India was 50 against 49 in the preceding year.

Of the total number of men invalided 30 per cent. were of less than two years' service, and 82 per cent. were of less than five years' service. With this is to be considered the fact that 78 per cent. of all the men in the strength of the army in 1890 were of less than five years' service.

The percentage to total invaliding of invaliding in the first four years of Indian service was 48 in the period 1871–75, 68 in the period 1881–85, and 65 in 1890; while the percentage of men invalided in the first four years of service who were under 30 years of age has risen from 73 in 1871–75 to 95 in 1890. Of the men invalided under four years of Indian service in 1890, 68 per cent. were also under 25 years of age.

Statistics of women and children.

The admission rate among women (789·5 per 1,000), though higher than in 1889 (766·0), was lower than in the two years before that. The chief causes of admission were debility, ague, and the diseases peculiar to women. The year was marked by the occurrence of influenza to the extent of 19·5 per 1,000 of strength, most of the cases arising in March and April. The other chief diseases which caused increased admission were pneumonia, other respiratory diseases, phthisis, malarial fevers, and measles; while there was a diminution in small-pox, puerperal affections, diseases peculiar to women, debility, and some other diseases. In the Bengal Presidency the admission rate was 754·0, in Madras 930·1, and in Bombay 701·6; the first showing an increase, as compared with the previous year, the others a decrease. Comparing the three Presidencies with reference to the incidence of certain diseases, Bengal had the highest ratio for cholera, enteric fever, ague, bowel complaints, and puerperal affections; Madras the highest for influenza, respiratory diseases, phthisis, debility, rheumatism, diseases peculiar to women, and entozoa.

The mortality among women (15·02) was lower than in any year since 1885. The chief causes of death were, in order, puerperal affections, phthisis, and enteric fever. The chief increase of mortality was in phthisis and circulatory diseases, and the chief decrease in debility, puerperal affections, and fevers. In the Bengal Presidency

the death rate was 14·16, in Madras 11·04, and in Bombay 22·58; Bombay being the only Presidency which had a higher death-rate than in the previous year, and Madras having a death-rate only half as great as that of 1889. Comparing the three Presidencies with regard to mortality from certain diseases, Bengal had the highest ratio for cholera, dysentery, and hepatitis; Bombay the highest for enteric fever, remittent fever, heatstroke, diarrhœa, pneumonia, phthisis, circulatory diseases, and puerperal affections. Bengal had no deaths from respiratory diseases; Madras none from cholera, bowel complaints, or hepatitis; and Bombay none from cholera or hepatitis. In Bengal the chief decrease was in puerperal affections; in Madras the chief decrease was in fevers; in Bombay the chief increase was in phthisis, and the chief decrease in cholera and fevers.

The admission rate among children (564·3), was higher than it has been since 1887, but lower than in any other year. The chief causes of admission were, in order, measles, ague, respiratory diseases, and debility. The greatest increase of admission was in measles; and the greatest decrease in diarrhœa. Besides the unusual addition to the sickness of 8·5 per 1,000 of strength from influenza, there was increase also in malarial fevers, dysentery, debility and convulsions. There was decrease in cholera, whooping-cough, non-malarial fevers, respiratory diseases, and entozoa. In the Bengal Presidency the admission rate was 477·2, in Madras 843·4, and in Bombay 442·9; the last being the only Presidency which had a lower ratio than in the previous year.

The mortality among children (47·02), was lower than it had been since 1886. The chief causes of death were, in order, convulsions, diarrhœa, debility, teething, respiratory diseases, tuberculous diseases, dysentery, measles, simple continued fever, diphtheria and croup, and remittent fever. The greatest increase of mortality was in measles, dysentery, and debility, debility including for the first time immaturity at birth; and the greatest decrease in enteric and other fevers, cholera, respiratory diseases, tuberculous diseases, and teething. There was decrease also in whooping-cough and diarrhœa. In the Bengal Presidency the death ratio was 51·97, in Madras 35·69, and in Bombay 47·95; Bengal being the only Presidency which had a higher death-rate than in the previous year, and Madras showing the greatest reduction and the lowest death-rate.

Native Troops.

Sickness and mortality in 1890.

The health of the Native Army of India was not even so good as in the unfavourable preceding year, all the ratios in the following table being increased. The admission rate, constantly sick rate, and death-rate among men present were higher than they had been since 1881; while the total mortality was greater than it had been since 1886. The year was characterised by epidemic influenza.

Sickness and Mortality during the period 1877–81 *and the years* 1881–90.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1877–81 -	118,669	1,422	48	1·94	24·90	27·40
1881 - -	114,612	1,305	46	0·97	19·24	22·62
1882 - -	114,894	1,129	37	1·02	12·24	14·76
1883 - -	114,830	923	31	1·15	11·76	14·31
1884 - -	114,827	1,042	33	0·71	10·50	12·22
1885* - -	115,486	978	32	1·61	13·67	16·09
1886* - -	106,010	973	31	1·27	13·27	19·46
1887* - -	105,254	1,045	33	1·31	11·68	18·17
1888† - -	124,822	995	33	2·14	12·84	16·14‡
1889 - -	128,642	1,003	35	0·68	12·94	16·19
1890 - -	127,746	1,137	39	1·83	15·91	18·64

* Excluding men on active service in Burma.
† Including Upper Burma for the last nine months of the year.
‡ Including deaths in Upper Burma in the first three months of the year.

The chief causes of admission were ague, diseases of the integuments, injuries, influenza, and dysentery. Among the diseases with raised admission rates were cholera, influenza, malarial and simple continued fevers, and respiratory diseases. Among those with lessened rates were small-pox, enteric fever, dysentery, rheumatism, diseases of the integuments, and injuries. Ague caused 46 per cent. of the total admissions. The chief causes of death were pneumonia, cholera, remittent fever, and dysentery. Among the diseases which caused increased mortality were cholera, dysentery, respiratory diseases, and remittent fever. Among those from which mortality was lessened were ague, debility, and hepatic affections. Pneumonia caused 25 per cent. of the total deaths. The chief causes of invaliding in the Native army were debility, rheumatism, and respiratory diseases.

If the statistics of Native troops be compared with those of European troops, it will be seen how much less the Native soldier suffered from enteric and simple continued fevers, hepatic affections, phthisis, circulatory diseases, tonsillitis, and venereal diseases, and how much more he suffered from influenza, ague, dysentery, pneumonia, eye diseases, scurvy, diseases of the integuments, and entozoa, than his European comrade.

Army of Bengal.

The statistics of the Native Army of Bengal for the year under review compare very unfavourably with the past, as may be seen from the following table:—

NATIVE ARMY OF BENGAL.

Sickness and Mortality during the ten-year period 1867 *to* 1876, *and of the years* 1881 *to* 1890 *compared.*

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1867–76	39,508	1,360	42	2·12	13·84	17·25
1881*	36,896	1,495	51	0·92	19·76	27·73†
1882	40,256	1,250	41	0·72	13·34	16·49
1883	40,932	985	32	0·56	10·55	13·98
1884	40,850	1,193	35	0·71	10·97	12·56
1885‡	40,753	1,076	34	0·29	10·11	14·18
1886§	40,547	1,065	34	1·87	14·45	22·29
1887§	54,547	1,195	36	1·52	12·47	18·94
1888‖	63,312	1,066	33	1·83	13·60	16·93¶
1889 (a)	65,360	1,116	37	0·38	12·96	16·30
1890 (a)	64,080	1,306	42	3·28	19·16	21·82

* Excluding troops in Afghanistan.
† These ratios are calculated on the total regimental strength, including the army in Afghanistan.
‡ Excluding men on active service in Burma and Egypt.
§ Excluding men on active service in Burma.
‖ Excluding men on active service in Burma for the first three months, and in Hazara for October and November
¶ Including deaths in Upper Burma in the first three months of the year.
(a) Includes the Punjab Frontier Force, not included here in the reports for 1887 and 1888.

The chief causes of admission were ague, diseases of the integuments, injuries, influenza, and dysentery. Among the diseases with raised admission rates were influenza, cholera, malarial fevers, and bowel complaints. Among those from which the rates were lessened were heatstroke, diseases of the integuments, injuries, rheumatism and enteric fever. Ague caused 51 per cent. of the total sickness. The chief causes of death were pneumonia, cholera, remittent fever, and dysentery. Among the diseases which caused increased mortality were cholera, respiratory diseases, remittent fever, and bowel complaints. Among those from which mortality was lessened, were small-pox, heatstroke, and ague. Pneumonia caused 28 per cent. of the total deaths, and cholera 17 per cent. The chief causes of invaliding were debility and rheumatism.

The general ratios for the various geographical sections of the Native Army of Bengal are shown in the following table:—

Year.	Ratio per 1,000.													
	Bengal Proper and Assam.		Gangetic Provinces.		Rohilkhand and Meerut.		Agra and Central India.		Punjab.		Punjab Frontier Force.		Quetta District.	
	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.	Admissions.	Deaths.
1867-76	1,523	19·13	1,062	8·38	987	11·19	1,588	9·61	1,459	14·24	1,680	15·88	—	—
1881	1,772	22·53	1,260	15·78	1,378	15·67	1,380	9·35	1,521	22·86	1,718	17·95	—	—
1882	1,569	18·22	1,081	10·01	1,083	9·98	1,398	7·18	1,268	13·30	1,992	15·94	—	—
1883	1,408	16·23	970	8·17	978	11·53	906	5·77	830	10·80	1,419	21·46	—	—
1884	1,567	14·61	929	6·00	1,188	10·62	1,312	7·84	1,063	8·49	1,262	10·71	—	—
1885	1,278	9·96	990	6·42	1,179	10·04	1,333	8·28	902	9·92	1,152	12·67	—	—
1886	1,692	38·45	896	5·35	1,349	13·64	1,366	6·99	779	8·61	979	9·83	1,637	86·02
1887	1,462	14·32	906	7·54	1,258	21·39	1,220	8·36	894	10·33	1,687	21·87	1,545	63·54
1888	1,107	18·81	830	8·08	998	10·19	1,171	9·11	789	10·05	1,369	15·61	1,337	22·07
1889	1,199	13·38	615	8·84	833	9·56	1,146	10·80	896	8·79	1,493	14·62	1,401	24·92
1890	1,869	24·58	862	7·91	1,150	17·24	962	14·00	1,056	17·72	1,693	18·62	2,065	27·66

The highest admission ratios were those of the Quetta District, of Bengal Proper, and Assam, and of the Punjab Frontier Force; and the lowest was that of the Gangetic Provinces. The ratios of all these four groups were higher than in 1889, and the ratios of Bengal Proper, and Assam, and of the Punjab Frontier Force were also higher than the decennial ratio, while that of the Gangetic Provinces was lower. The highest death ratios were those of the Quetta District, and of Bengal Proper, and Assam; and the lowest was that of the Gangetic Provinces. The ratios of the first two were higher than in the preceding year, and that of the second than the decennial average; while that of the Gangetic Provinces was below the ratios of both 1889 and the decennium.

The geographical groups of the Bengal Native Army are compared in respect of sickness from certain causes in the following table:—

Causes of Admission.	Ratio of Admission per 1,000 of Strength.						
	1.	2.	3.	4.	5.	6.	7.
	Bengal Proper and Assam.	Gangetic Provinces.	Rohilkhand and Meerut.	Agra and Central India.	Punjab.	Punjab Frontier Force.	Quetta District.
Enteric fever	·3	·3	—	—	·1	·3	—
Intermittent fever	861·2	297·4	423·3	436·0	550·3	1,019·7	1,332·6
Remittent fever	27·4	7·0	12·8	18·5	17·8	21·2	68·0
Simple continued fever	3·5	·2	23·5	13·0	17·0	2·4	—
Dysentery	153·8	36·5	38·5	41·5	43·6	78·4	160·7
Diarrhœa	50·2	10·9	32·0	19·2	13·1	18·2	39·9
Hepatitis	2·3	1·4	2·2	2·4	1·1	·7	2·9
Spleen diseases	29·8	10·4	7·2	10·4	8·8	16·6	19·4
Respiratory diseases	76·7	23·1	32·6	36·8	53·7	89·5	205·3
Phthisis pulmonalis	4·5	3·9	2·6	2·1	2·8	4·1	1·2
Rheumatism and neuralgia.	31·8	17·5	26·5	18·7	18·0	28·7	28·7
Venereal diseases	70·6	40·8	53·3	40·8	38·5	22·0	24·0
All Causes	1,868·9	861·9	1,149·5	962·1	1,055·8	1,693·1	2,367·7

Bengal Proper and Assam had the highest admission ratios from diarrhœa, spleen, diseases, phthisis, rheumatism, and venereal diseases; Rohilkhand and Meerut the highest from simple continued fever; and the Quetta district the highest from ague, remittent fever, dysentery, hepatitis, and respiratory affections.

In the following, again, the groups are compared in respect of certain causes of mortality:—

Causes of Death.	Ratio of Death per 1,000 of Strength.						
	1. Bengal Proper and Assam.	2. Gangetic Provinces.	3. Rohilkhand and Meerut.	4. Agra and Central India.	5. Punjab.	6. Punjab Frontier Force.	7. Quetta District.
Cholera	1·34	·62	3·23	2·07	5·30	—	—
Enteric fever	·17	·16	—	—	·05	·24	—
Intermittent fever	3·01	·31	·46	·69	·41	·57	—
Remittent fever	4·68	·16	2·00	2·42	1·60	1·87	2·93
Simple continued fever	—	—	·15	·17	·09	—	—
Dysentery	4·01	·31	·92	—	·37	·81	1·76
Diarrhœa	2·51	·62	·46	·17	·37	·49	—
Abscess of liver	—	—	—	—	—	·08	·59
Pneumonia	1·67	1·40	3·85	4·67	5·39	9·35	19·94
Phthisis pulmonalis	1·50	·62	1·54	·17	·59	1·30	·59
Anæmia and debility	1·17	·16	·31	·17	·27	·08	—
All Causes	24·58	7·91	17·24	14·00	17·72	18·62	34·02

Bengal Proper and Assam had the highest mortality from ague, remittent fever, dysentery, diarrhœa, and debility; Rohilkhand and Meerut the highest from phthisis; the Punjab the highest from cholera; the Punjab Frontier Force the highest from enteric fever; and the Quetta district the highest from hepatic abscess and pneumonia.

Of the large garrisons with a strength of not less than 1,000 the following returned death-rates higher than the Presidency ratio (19·16):—Dharmsala, 93·84; Dehra Dun, 37·20; Quetta, 34·58; Dera Ismail Khan, 31·30; Agra, 28·78; Meean Meer, 20·49; Jhansi, 20·24.

Corps in Central India and Rajputana.

Apart from a diminution in the admission rate from 801 per 1,000 to 702, the statistics of the corps in Central India and Rajputana were less satisfactory than in the previous year, the death-rate having risen from 7·56 to 9·96 per 1,000. The chief causes of admission were ague, injuries, diseases of the integuments, and influenza. Among the diseases with raised admission rates were influenza, simple continued fever, phthisis, and guinea-worm. Among those from which the rates were lessened were ague, bowel complaints, scurvy, and pneumonia. Ague caused 38 per cent. of the total sickness. The chief canses of death were pneumonia and remittent fever. Among the diseases which caused increased mortality were cholera, respiratory diseases, and malarial fevers. Among those from which mortality was lessened were bowel complaints. Pneumonia caused 39 per cent. of the total deaths, and remittent fever 11 per cent.

Hyderabad Contingent.

The health of the Hyderabad Contingent improved greatly, all the ratios showing a satisfactory reduction. The admission rate fell from 555 to 553 per 1,000, the daily sick rate from 19 to 17, and the death-rate from 8·65 to 4·81. The chief causes of admission were ague, injuries, diseases of the integuments, and influenza. Among the diseases with raised admission rates were influenza and simple continued fever. Among those from which the rates were lessened were cholera, small-pox, enteric fever, malarial fevers, bowel complaints, scurvy, and pneumonia. Ague caused 28 per cent. of the total sickness, and influenza 12 per cent. The chief cause of death was pneumonia. Among the diseases which caused increased mortality were malarial fevers and phthisis. Among those from which mortality was lessened were cholera, debility, and dysentery. Pneumonia caused 29 per cent. of the total deaths.

Though the death-rates in the following table show a satisfactory reduction, there was a decided increase in sickness, probably in great part due to the influenza epidemic:— Madras Army.

NATIVE ARMY OF MADRAS.

Sickness and Mortality during the last Ten Years

YEAR.	Average Strength.	RATIO PER 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	DEATHS FROM		
				Cholera.	All Causes.	
1881 - -	28,533	997	41	1·37	12·02	16·75
1882 - - -	27,654	879	30	2·46	12·01	14·99
1883 - -	27,703	737	27	2·92	10·76	12·51
1884 - -	28,050	836	31	1·46	10·02	11·82
1885* - -	27,043	675	25	1·29	9·69	13·96
1886† - -	22,070	756	30	2·54	14·05	21·25
1887† - -	20,031	772	32	1·49	11·53	22·22
1888† - -	25,671	886	36	4·17	15·31	20·10‡
1889 - -	26,808	856	37	1·45	19·21	23·99
1890§ - - -	26,032	924	41	0·54	15·63	20·64

* Excluding men on active service in Burma and Egypt. † Excluding men on active service in Burma.
‡ Including deaths in Upper Burma for the first three months of the year.
§ Excluding certain men in the Chin-Lushai Expedition.

The chief causes of admission were ague, diseases of the integuments, and injuries. Among the diseases with raised admission rates were influenza, simple continued fever, respiratory diseases, and ague. Among those from which the rates were lessened were cholera, small-pox, bowel complaints, and guinea-worm. Ague caused 38 per cent. of the total sickness. The chief causes of death were malarial fevers, debility, dysentery, and pneumonia. Among the diseases which caused increased mortality were phthisis and simple continued fever. Among those from which mortality was lessened were cholera, small-pox, bowel complaints, malarial fevers, debility, and scurvy. Malarial fevers caused 24 per cent. of the total deaths, debility 12 per cent., and dysentery and pneumonia each 9 per cent. The chief causes of invaliding were debility and rheumatism. None of the large garrisons of over 1,000 in strength returned death-rates over the Presidency ratio (15·63) of the year.

The following table compares the statistics of Upper Burma with those of Lower Burma. It also compares the statistics of the troops of the different presidential armies:—

TROOPS IN UPPER AND LOWER BURMA.

Sickness and Mortality during 1890.

	Average Strength.	RATIO PER 1,000 OF STRENGTH.			
		Admissions into Hospital.	Constantly Sick.	DEATHS FROM	
				Cholera.	All Causes.
Bengal Troops in Upper Burma -	1,754	2,488	113	24·52	78·68
Madras „ „ „ -	5,334	1,614	71	1·12	40·49
Bombay „ „ „ -	205	1,556	78	4·88	34·15
Upper Burma as a whole - -	7,292	1,822	81	6·86	49·51
Lower Burma and Andamans (Madras troops).	3,061	767	41	·65	13·39

Upper Burma was much more unhealthy than Lower Burma; and in Upper Burma the Bengal troops suffered the most severely, especially from cholera. All the deaths from cholera took place in the 2nd battalion 3rd Gurkhas, a regiment that only arrived in Burma in November.

Bombay Army.

The health of the Native Army of Bombay deteriorated. All the ratios in the following table, except that of cholera mortality, were higher than in 1889 :—

NATIVE ARMY OF BOMBAY.

Sickness and Mortality during the last Ten Years.

YEAR.	Average Strength.	RATIO PER 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	DEATHS FROM		
				Cholera.	All Causes.	
1881	18,349	1,168	41	1·85	14·01	25·93¶
1882*	23,772	1,067	36	0·46	12·16	13·41
1883	23,576	994	35	0·47	12·81	14·96
1884	23,373	1,153	38	0·39	12·96	14·35
1885†	22,701	1,243	43	5·42	24·84	26·01
1886†	21,089	1,231	37	0·14	15·98	20·89
1887†	20,353	1,092	34	0·69	11·50	15·45
1888‡	23,570	1,080	35	1·57	10·52	13·37**
1889§	23,993	1,024	33	0·58	8·13	10·74
1890‖	24,032	1,139	35	0·12	10·99	12·92

* Including troops in Southern Afghanistan. † Excluding men on active service in Burma and Egypt.
‡ Excluding men on active service in Burma for the first three months of the year.
§ The returns are not quite complete. ‖ Excluding certain men on escort duty and in the China-Lushai Expedition.
¶ These ratios are calculated on the total regimental strength, including the army in Afghanistan.
** Including deaths in Burma in the first three months of the year.

The chief causes of admission were ague, diseases of the integuments, influenza, injuries, and respiratory affections. Among the diseases with raised admission rates were influenza, simple continued fever, and respiratory diseases. Among those from which the rates were lessened were cholera, small-pox, and bowel complaints. Ague caused 40 per cent. of the total sickness. The chief cause of death was pneumonia. Among the diseases which caused increased mortality were dysentery and pneumonia. Among those from which mortality was lessened were cholera, phthisis, small-pox, and diarrhœa. Pneumonia caused 34 per cent. of the total deaths. The chief causes of invaliding were debility and respiratory diseases. Of the large garrisons with a strength of over 1,000 the following returned death-rates over the Presidency ratio for the year (10·99) :—Quetta 25·42, and Aden 16·80.

Of the geographical groups of Madras and Bombay, Aden and Sind had the highest admission rate from scurvy; the Quetta District the highest from influenza, hepatitis, pneumonia, other respiratory diseases, and tonsillitis; the Northern Division, Bombay, the highest from enteric fever, hepatic abscess, and guinea-worm; the Konkan the highest from simple continued fever; the Bombay troops in Burma the highest from ague, dysentery, phthisis, rheumatism, and diseases of the integuments; the Northern Division, Madras, the highest from entozoa other than guinea-worm; and the Madras troops in Upper Burma the highest from remittent fever, diarrhœa, spleen diseases, and venereal affections. Aden and Sind had the highest death-rate from scurvy; the Quetta District the highest from respiratory diseases other than pneumonia; the Northern Division, Bombay, the highest from enteric fever; the Bombay troops in Burma the highest from cholera, pneumonia, and phthisis; and the Madras troops in Upper Burma the highest from ague, remittent fever, bowel complaints, and debility.

Having considered individually the health statistics of the several portions of the Native Army of India in the foregoing paragraphs, it will now be convenient to contrast the main features of the same, and for ready reference the chief results are brought together in the following table :—

CORPS.	Total Deaths per 1,000, including Absentees.	Average Strength present with Regiments.	RATIO PER 1,000.			
			Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Present Deaths from all Causes.
Bengal Native Army	21·82	64,080	1,306	42	3·28	19·16
Madras „ „	20·64	26,032	924	41	·54	15·63
Bombay „ „	12·92	24,032	1,139	35	·12	10·99
Corps of Central India and Rajputana	9·96	5,118	702	21	·78	9·96
Hyderabad Contingent	6·71	7,071	553	17	—	4·81
India	18·64	127,746	1,137	39	1·83	15·91

As usual, the health of the Hyderabad Contingent and of the corps of Central India and Rajputana was, on the whole, the best. Sickness and mortality were greatest in the Bengal Army. The comparison is carried into greater detail in Table V.

Some general remarks regarding the epidemic of influenza have already been made, *see* page 50. The first station to record several cases was Neemuch, in February. In the Bengal Army the first stations to register the beginning of the epidemic were Jubbulpore, Lucknow, and Dharmsala, in the week ending 14th March. The disease did not appear in Port Blair till April; and there was no record of the occurrence of the disease in Upper Burma till May and June, and then only a few cases. It must be remembered that what has just been said applies only to the influenza of the Native army; for in any given station or group of stations the general population, the European troops, the Native troops, and the prisoners were not always simultaneously affected; and one or other, or more, of these bodies sometimes escaped altogether, or, at least, returned no influenza. Thus in Rangoon the disease is said to have been present among the general population from about the middle of March, whereas the European troops did not return any cases till May and June, and neither the Native troops nor the prisoners returned any cases at all. In the case of certain stations returning no influenza, an increase of respiratory disease and simple continued fever in the influenza season indicates the possibility of a failure in diagnosis. Certain medical officers also, while calling the disease influenza in their notes, continued to return it as "catarrhal bronchitis," &c. On the other hand, during the prevalence of the epidemic, cases may have been called influenza which were really of a more simple nature. Of the stations of the Native army about 57 per cent. returned influenza, and about 43 per cent. returned none. The admission rate in the Native army was 64·3 per 1,000 of strength, the mortality 0·41 per 1,000 of strength, and the fatality 0·63 per cent. of cases treated. The following table:— **Principal diseases. Influenza.**

	Per 1,000 of Average Strength.											
	Influenza.		Increase or Decrease as compared with 1889.									
			Pneumonia.		Other Respiratory Diseases.		Simple continued Fever.		Ague.		All causes.	
	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.
European Troops -	33·4	·03	+2·0	+ ·44	+5·9	+ ·18	− 2·2	− ·02	+19·7	− ·03	+ 22·2	−2·76
Native Troops -	64·3	·41	+4·8	+1·30	+7·9	+ ·18	+ 5·3	+ ·04	+54·5	− ·12	+134·3	+2·97
Prisoners - -	78·6	·67	+1·8	+ ·77	+5·7	+ ·31	+17·8	+ ·06	+30·2	− ·04	+ 77·0	−5·07

shows that the Native were more severely affected than the European troops, less severely than the prisoners. It shows also how both sickness and mortality from pneumonia and other respiratory diseases were increased in all three bodies; how ague increased in all, and simple continued fever among the Natives; and how, while the general admission rate increased in all, the general death-rate was raised only in the Native troops.

To fevers returned as malarial were due 46 per cent. of the sickness and 17 per cent. of the mortality of the Native Army. Both the admission and death ratios per 1,000 of strength from these fevers rose in 1890. **Fevers.**

The ratio of admission from enteric fever in the Native army in 1890 was 0·1 per 1,000 of strength. Since, at least, 1880 this ratio has never been higher than 0·3, and has usually been 0·2. In the same period the extreme mortalities were 0·14 and 0·04. The mortality of 1890 was 0·07, as in 1889. The following table:—

Admission and Death-rates per 1,000 *from* ENTERIC FEVER *in the European Troops, Native Troops, and Jails of India compared.*

	1877 to 1886.		1890.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops	8·9	3·15	18·5	4·91
Native troops	·2	·10	·1	·07
Jail population	·2	·10	·2	·09

shows that the ratios for European troops are very unlike those for Native troops and prisoners. *Post-mortems* are rarely obtained in the case of Native soldiers; but among prisoners nearly every fatal case is subjected to *post-mortem* examination. Under these circumstances the fact that the ratios of prisoners and sepoys for a 10-year period are practically identical appears to show that the Native troops really suffer less than the European.

Again, the following table shows that the fever-mortality in the European and Native armies is not the same in amount :—

Fever Mortality of Native Troops compared with that of European Troops in 1890.

Causes of Deaths.	Died per 1,000 of average Strength.		Relative Liability in Percentages.			Percentage in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total=100.	European Troops.	Native Troops.
Ague	·16	·99	13·9	86·1	100	1·2	6·2
Remittent fever	·47	1·75	21·2	78·8	100	3·4	11·0
Simple continued fever	·01	·13	7·1	92·9	100	·1	·8
Enteric fever	4·91	·07	98·6	1·4	100	35·5	·4
Total	5·55	2·94	65·4	34·6	100	40·2	18·4

The total fever-mortality among Native troops in 1890 was to the total fever-mortality among European troops as 1 : 1·9. For the period 1877–86 the corresponding ratio was 1 : 1·4, and for 1889 it was 1 : 2·6. Again, among European troops 40 per cent. of all deaths were from fevers; only 18 per cent. among Native troops in 1890. It appears then that Native soldiers and prisoners are less liable to contract enteric fever than Europeans are. This might be due to:—1*st*—Racial peculiarity, of which evidence is wanting; 2*nd*—Acquired tolerance from constant contact with the specific poison. The constant presence of the bacillus in the surroundings of native life remains to be demonstrated. No length of time spent by generations amid non-specific filth would confer relative insusceptibility. The most defective sanitation cannot, of itself, produce enteric fever; but it renders possible and likely the presence of the specific filth where it ought not to be, and its conveyance into the human body. 3*rd*—Comparative immunity of Native adults as a result of prevalence of the disease among Native children. This view is held by some European and Native medical men, who also see in the contamination of water, milk, &c. by the excretions of the affected Native children the main source of the enteric fever that scourges the European garrison of the country. No settlement of this point can be approached till more is accurately known regarding the infantile diseases of Natives. In this connexion it may be interesting to note that, contrary to the common teaching, Whitelegge,* from an examination of the Registrar-General's (England) statistics, is of opinion that "It is probable that true enteric fever is rare "among infants and young children, and that many of the cases at those ages are due "to faulty diagnosis."

In the whole Native Army of India 18 cases with nine deaths were returned as enteric fever, as against 25 with nine in 1889. Of the deaths six were in the Bengal Army, two in the Bombay Army, and one in the Madras Army.

* Hygiene and Public Health, page 298.

The following table shows the ratios of admission and mortality from respiratory diseases in the principal divisions of the Native army :— Respiratory diseases.

Period.	Ratio per 1,000 of Strength.											
	India.		Bengal.*		Corps of Central India and Rajputana.		Hyderabad Contingent.		Bombay.		Madras.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1881–85	56	4·24	56	4·15	38	3·37	25	1·40	91	6·73	27	1·53
1886	51	3·68	51	3·28	34	2·10	23	·94	81	7·11	28	1·99
1887*	45	3·08	49	3·57	29	1·88	22	·99	69	4·42	20	1·20
1888*	39	2·68	41	3·70	22	1·53	22	·96	59	2·50	22	1·01
1889*	42	3·14	45	4·03	43	2·71	26	2·59	58	2·55	25	1·79
1890*	55	4·62	60	6·24	41	4·89	25	1·69	78	4·37	32	1·65

* Including Punjab Frontier Force.

Except in the case of the Corps of Central India and Rajputana, and of the Hyderabad Contingent, the admission ratios were considerably less favourable than in the previous year. This was probably due in greatest part to the influenza epidemic. The increase was greatest in the case of Bombay. All the corps death-rates, except the Hyderabad Contingent and Madras were unfavourable, the comparison with the past being worst in the case of Bengal.

The highest admission and death-rates were in the Quetta District, the Punjab Frontier Force, and the Bombay troops in Burma.

The following table gives the admission and death-rates per 1,000 from pneumonia in 1890, and shows a general deterioration :—

Period.	India.		Bengal.		Madras.		Bombay.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1888	9·1	2·21	11·9	3·02	3·7	1·00	8·2	2·03
1889	11·9	2·66	15·4	3·43	4·8	1·38	8·8	2·13
1890	16·7	3·96	22·4	5·40	4·9	1·38	16·8	3·79

Then follows a table from which may be seen at a glance the incidence of mortality from pneumonia in the various geographical groups :—

Deaths from Pneumonia.

	Burma, Bengal Troops.	Bengal Proper and Assam.	Gangetic Provinces.	Rohilkhand and Meerut.	Agra and Central India.	Punjab.	*Punjab Frontier Force.	*Quetta District, Bengal Troops.	Bengal Presidency.	Corps of Central India and Rajputana.	Aden and Sind.	Quetta District, Bombay Troops.	Northern Division, Bombay.	Konkan.	Burma, Bombay Troops.	Hyderabad, Nagpur, Khandeish, and Deccan.	Northern Division, Madras.	Lower Burma and Andamans.	Upper Burma, Madras Troops.	Madras Presidency.	Bombay Presidency.	Hyderabad Contingent.	Army of India.
Death-rates per 1,000 of average annual strength.	2·28	1·67	1·40	3·85	4·67	5·39	9·35	19·94	5·40	3·91	2·24	11·94	3·28	1·79	14·63	1·31	·46	·98	1·69	1·38	3·79	1·41	3·96
Percentages in total deaths.	2·9	6·8	17·6	22·3	33·3	30·4	50·2	58·6	28·2	39·2	17·5	48·0	38·7	21·4	42·9	19·2	5·6	7·3	4·2	8·8	34·5	29·4	24·9

* These two partially overlap.

It shows well the high mortality from pneumonia in the Quetta District, on the Punjab frontier, and among the Bombay troops in Burma. It also shows the high percentage of pneumonia to the total death-causes in those regions. Again, from the following :—

Cause of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentages in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total = 100.	European Troops.	Native Troops.
Pneumonia - -	·90	3·96	18·5	81·5	100	6·5	24

it may be gathered that in 1890 the mortality of Native soldiers was more than four times as great as that of European soldiers.

Jails.

Sickness and mortality in 1890.

There was an increase, as shown in the subjoined table, of the average jail population in 1890. The admission and constantly sick rates were high from the occurrence of epidemic influenza, whereas the death-rate was considerably reduced. The death-rates from cholera and from bowel complaints were both unusually low.

Statement showing the Strength, Sickness, and Mortality among the Prisoners of India during the years 1872–76, 1877–81, 1882–86 *and* 1887 *to* 1890.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
1872–76 - -	99,758	1,016	?	2·86	13·48	36·24
1877–81 - -	112,670	1,189	45	4·48	24·97	63·01
1882–86 - -	87,059	1,056	38	2·27	11·56	33·29
1887 - -	79,468	1,083	37	4·08	11·53	34·15
1888 - - -	91,445	1,129	38	4·68	10·55	35·57
1889* - - -	96,121	1,155	38	4·52	10·86	36·56
1890† - -	96,610	1,232	40	1·44	8·98	31·49
* Including the subsidiary jails 98,720		1,152	38	—	—	36·63
† Including the subsidiary jails 99,324		1,226	39	—	—	31·10

The chief causes of admission were ague, dysentery, abscess, &c., influenza, and diarrhœa. Among the diseases with raised admission rates were influenza, simple continued fever, gangrene, ague, respiratory diseases, and guinea-worm. Among those from which admission rates were lower were cholera, small-pox, heatstroke, enteric fever, bowel complaints, debility, and scurvy. Ague caused about 43 per cent. of the total sickness. The chief causes of death were, in order, dysentery, pneumonia, diarrhœa, and phthisis. Among the diseases which caused increased mortality were pneumonia and other respiratory diseases, gangrene, hepatitis, and simple continued fever. Among those from which mortality was lessened were cholera, small-pox, heatstroke, enteric fever, bowel complaints, phthisis, and debility. Twenty-eight per cent. of the deaths were from bowel complaints, and 23 per cent. from respiratory diseases.

The following statement shows for each Presidency the proportion of prisoners to each 10,000 of the population; the population, that is to say, according to the census of 1881. In 1889 and 1890 the strength of subsidiary jails is included.

Ratio of Prisoners per 10,000 *of Population in each of the three Presidencies for* 1890, 1889, 1888, 1887, 1886, 1885, *and* 1872–76 *compared.*

Presidency.	Period.	General Population, according to Census of 1881.	Prisoners.		
			Average Number.	Proportion to 10,000 of Population.	Deaths per 1,000 of Average Strength.
Bengal	1872–76	—	68,328	4·6	39·39
	1885	147,215,384	49,404	3·4	38·40
	1886		50,028	3·4	32·32
	1887		47,306	3·2	36·36
	1888		54,434	3·7	33·93
	1889*		58,051	3·9	35·14
	1890*		58,696	4·0	32·11
Madras	1872–76	—	9,607	—	32·37
	1885	31,170,631	6,942	2·2	17·86
	1886		6,904	2·2	17·53
	1887		6,057	1·9	22·12
	1888		7,880	2·5	27·64
	1889*		8,392	2·7	38·49
	1890*		8,927	2·9	23·75
Bombay	1872–76	—	8,011	4·9	26·61
	1885	16,454,414	6,872	4·2	33·76
	1886		6,767	4·1	30·44
	1887		5,667	3·4	19·06
	1888		6,521	4·0	22·24
	1889*		7,461	4·5	31·10
	1890*		7,576	4·6	32·34

* Including subsidiary jails.

The following table compares the sickness and mortality of the prison populations of the three Presidencies:—

Sickness and Mortality among Prisoners in the three Presidencies during 1890 *compared.*

Presidency.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
Bengal	57,500	1,236	39	1·67	9·36	32·37
Madras	7,702	810	28	2·60	7·54	25·32
Bombay	7,284	861	29	·55	7·96	32·81

The highest admission and constantly sick rates were in Bengal; the highest general death-rate in Bombay. The highest mortality from cholera was in Madras, and the highest from bowel complaints in Bengal. In the Bengal Presidency the increase of sickness was mostly due to influenza; in the Madras Presidency the increase of mortality was mostly in respiratory diseases. The cholera death ratio of Madras fell from 11·83 to 2·60.

Chief causes of sickness in the Bengal Presidency.

The chief causes of admission in the Bengal Presidency in 1890 were ague, dysentery, influenza, abscess, &c., and diarrhœa. The greatest increase was due to influenza; while there was diminished sickness from cholera, bowel complaints, and enteric fever. Ague caused 45 per cent. of the total sickness.

The following is a comparative statement of the chief forms of sickness in 1890 and other years:—

Statement showing the Chief Diseases which have caused Admissions into Hospital in the Jails of the Bengal Presidency from 1881–90.

Number.	Diseases.	Decennial Average, 1873–82.	Admitted per 1,000 of Average Strength.									
			1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.
1	Fevers (including small-pox)	490	586	516	492	441	406	442	454	390	542	529
2	Dysentery - -	112	100	111	106	118	122	137	117	100	117	105
3	Diarrhœa - -	103	78	104	98	93	103	111	106	100	108	106
4	Respiratory diseases -	44	62	56	45	49	44	40	36	39	45	48
5	Anæmia and debility -	28	21	20	29	34	36	34	28	27	28	28
6	Rheumatism - -	17	14	13	14	15	15	16	16	16	16	15
7	Eye diseases - -	13	16	17	18	15	17	14	13	13	15	13
	Total of the Seven -	802	877	837	802	765	743	794	770	685	871	844
	Total from all Causes -	1,091	1,236	1,125	1,079	1,020	1,003	1,060	1,028	949	1,178	1,151

The ratios of the first, fourth, fifth, and sixth diseases were above the corresponding ratios of 1889; those of the first, fourth, and seventh were above the decennial average.

The chief causes of mortality were pneumonia and dysentery. Remittent fever, respiratory, and hepatic affections were among the diseases which gave rise to higher mortality than in the previous year; while less mortality occurred from cholera, bowel complaints, and debility. Pneumonia and dysentery caused each about 21 per cent. of the total mortality. The following is a comparative statement of the principal causes of death in 1889 and other years:—

Statement showing the Diseases which have been the chief causes of Mortality amongst Prisoners of the Bengal Presidency from 1881–90.

Number.	Diseases.	Decennial Average, 1873–82.	Died per 1,000 of Average Strength.									
			1890.	1889.	1888.	1887.	1886.	1885.	1884.	1883.	1882.	1881.
1	Dysentery and diarrhœa -	18·90	9·36	10·76	10·17	13·19	11·81	14·68	12·66	12·93	17·31	17·91
2	Respiratory diseases -	7·18	8·28	7·56	6·54	6·87	6·85	5·83	6·03	6·00	7·26	7·62
3	Fevers* - - -	5·40	2·37	2·85	3·09	2·58	2·82	2·57	2·30	2·49	3·58	4·70
4	Cholera - - -	3·46	1·67	3·97	4·17	4·21	1·78	4·07	1·32	2·35	3·11	3·10
5	Anæmia and debility -	3·10	1·62	1·65	2·20	2·05	2·60	2·49	2·10	2·02	3·04	2·58
6	Phthisis pulmonalis -	2·50	2·14	2·09	2·17	1·86	2·24	2·41	2·12	2·31	1·98	2·24
7	Spleen diseases - -	0·35	0·31	0·16	0·28	0·39	0·38	0·20	0·27	0·34	0·19	0·22
	Total of the Seven	40·89	25·75	29·04	28·62	31·08	27·48	32·25	27·00	28·44	36·47	38·37
	Total from all Causes -	47·36	32·37	34·84	33·93	36·36	32·32	38·40	32·71	34·28	42·36	44·42

* Including small-pox.

The ratios of only the second, sixth, and seventh were above the corresponding ratios of 1889, of only the second above the decennial average. The death-rates from dysentery and diarrhœa separately were as follows compared with the previous year:—

	Ratio per 1,000 of Average Strength.	
	1890.	1889.
Dysentery - - - -	6·75	7·35
Diarrhœa - - -	2·61	3·41
	9·36	10·76

Twenty-nine per cent. of all deaths were from those diseases.

There were 5 deaths from enteric fever against 6 in the previous year, 20 from cerebro-spinal fever against 31, and none from typhus against 7.

As regards sickness the Punjab and Bengal Proper and Assam were worst; while, as regards mortality, the worst were Bengal Proper and Assam and the Gangetic Provinces. The best with regard to sickness were the Gangetic Provinces and the Central Provinces, and the best with regard to mortality the Central Provinces and Rohilkhand.

The various jail administrations of India are compared in the following tables in respect of total mortality, and of the mortality from certain diseases:—

Statement showing the Diseases which have been the chief causes of Mortality amongst Prisoners of the different administrative areas during the year 1890.

Causes of Death.	Died per 1,000 of Average Strength.									
	Convict Settlement, Andamans.	Burma.	Assam.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Bombay.	Berar.	Central Provinces.	Madras.
Cholera	—	1·68	1·65	2·22	2·32	·40	·55	—	—	2·60
Fevers	4·73	3·19	1·65	3·35	1·72	3·14	3·98	—	·89	·65
Pneumonia	3·88	3·10	6·61	4·01	6·55	11·98	7·28	2·02	3·82	2·60
Dysentery and diarrhœa	8·61	9·57	12·39	10·59	10·06	7·08	7·96	3·03	7·86	7·54
Phthisis pulmonalis	3·97	2·39	·83	2·72	2·16	1·93	1·78	3·03	1·35	1·43
Anæmia and debility	1·69	1·77	3·30	2·00	1·72	·40	2·61	—	2·92	3·12
All causes	34·62	28·26	37·16*	32·99*	33·82*	31·29*	32·81*	18·16	26·06	25·32*

* Excluding subsidiary jails.

The Andamans had the highest mortality from fevers and from phthisis, and were (as always) free from cholera; Assam had the highest mortality from bowel complaints and debility and the lowest from phthisis; the North-Western Provinces had the highest mortality from cholera; the Punjab had the highest mortality from pneumonia, and the lowest from anæmia and debility; and Berar the lowest from pneumonia and bowel complaints.

Though the constantly sick rate of the convict settlement of the Andamans was increased, the admission rate, the death-rate from bowel complaints, and the general death-rate were diminished. Though the death-rate has been diminishing since 1888, it has not yet reached nearly so low a point (23·03) as in 1887. The chief causes of admission were ague, abscess, &c., respiratory diseases other than pneumonia, and dysentery. Among the diseases with raised admission rates were influenza and respiratory diseases. Among those with lessened admission rates were malarial fevers and bowel complaints. Ague caused 59 per cent. of the total sickness. The chief causes of death were dysentery, remittent fever, phthisis, pneumonia, diarrhœa, other respiratory diseases, and injuries. Among the diseases which caused increased mortality were respiratory diseases and gangrene. Among those from which mortality was lessened were bowel complaints, circulatory diseases, phthisis, and debility. Bowel complaints caused 25 per cent. of the total deaths, and remittent fever 14 per cent.

The health of the Burmese jails again decidedly improved in 1890, all the ratios except the admission-rate being considerably lower than the corresponding ratios of the previous year. The chief causes of admission were simple continued fever, ague, abscess, &c., influenza, dysentery, and diarrhœa. Among the diseases with raised admission rates were influenza and rheumatism; but the rates of all the other chief diseases, such as cholera, small-pox, malarial fevers, bowel complaints, respiratory diseases and scurvy were lessened. Simple continued fever caused 22 per cent. of the total sickness, and ague 13 per cent. The chief causes of death were dysentery, diarrhœa, pneumonia, and phthisis. Among the diseases which caused increased mortality were pneumonia and ague. Among those from which mortality was lessened were cholera, small-pox, enteric fever, remittent fever, respiratory diseases other than pneumonia and phthisis. Bowel complaints caused 34 per cent. of the total deaths.

The following, which compares the jails of Upper and Lower Burma with regard to mortality from certain diseases, shows that the striking difference displayed in the corresponding table of last report no longer exists, though Upper Burma has the higher ratios from pneumonia, bowel complaints, and debility:—

	Deaths per 1,000 of Strength from						
	Cholera.	Fever.	Pneumonia.	Dysentery and Diarrhœa.	Phthisis pulmonalis.	Anæmia and debility.	All causes.
Upper Burma	·35	1·40	3·52	13·37	1·76	2·46	27·46
Lower Burma	2·13	3·79	2·96	8·29	2·60	1·54	28·53

There was a great improvement in the health of the prisoners of Assam. The admission rate declined from 1,955 to 1,834 per 1,000 of average strength, the constantly sick rate from 58 to 50, and the death-rate from 51·96 to 37·16. The chief causes of admission were ague, diarrhœa, influenza, dysentery, and abscess, &c. Among the diseases with raised admission rates were influenza, phthisis, and rheumatism. Among those with lessened rates were cholera, fever, spleen diseases, respiratory diseases, and bowel complaints. Ague caused 36 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, diarrhœa, and debility. Among the diseases which caused increased mortality were remittent fever, pneumonia, phthisis, and debility. Among those from which mortality was lessened were cholera, bowel complaints, and scurvy. Bowel complaints caused 33 per cent. of the total deaths, and pneumonia 18 per cent.

The health of the prisoners of Bengal markedly improved. With the exception of the cholera death-rate, all the ratios were lower than in 1889, the admission rate having fallen from 1,265 to 1,209 per 1,000, the constantly sick rate from 48 to 40, and the death-rate from 44·77 to 32·99. The chief causes of admission were ague, dysentery, influenza, and diarrhœa. Among the diseases with raised admission rates were influenza, respiratory diseases, and rheumatism. Among those with lessened rates were cholera, bowel complaints, ague, and enteric fever. Ague caused 31 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, phthisis, diarrhœa, cholera, and debility. Among the diseases which caused increased mortality were debility, respiratory diseases, and hepatic affections. Among those from which mortality was lessened were cholera, bowel complaints, malarial fevers, and phthisis. Bowel complaints caused 32 per cent. of the total deaths.

The health of the prisoners of the North-Western Provinces and Oudh shows a marked deterioration as compared with the previous year, all the ratios being unusually high. The admission rate rose from 742 to 927 per 1,000, the constantly sick rate from 22 to 36, and the death-rate from 28·37 to 33·82. The chief causes of admission were ague, influenza, abscess, &c., and dysentery. Among the diseases with raised admission rates were influenza, ague, debility, bowel and lung diseases. Among those with lessened rates were enteric and remittent fevers, and spleen diseases. Ague caused 38 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, diarrhœa, cholera, and phthisis. Among the diseases which caused increased mortality were cholera, bowel complaints, remittent fever, respiratory diseases, and phthisis. Among those from which mortality was lessened were debility and ague. Bowel complaints caused 30 per cent. of the total deaths, and pneumonia 19 per cent.

The ratios in the Punjab were all worse than they have been of late years. The admission rate rose from 1,682 per 1,000 in 1889 to 1,935, the constantly sick rate from 38 to 47, and the death-rate from 29·19 to 31·29. The chief causes of admission were ague, abscess, &c., dysentery, and diarrhœa. Among the diseases with raised admission rates were malarial fevers, influenza, simple continued fever, dysentery, debility, abscess, &c., and guinea-worm. Among those with lessened rates were small-pox, enteric fever, "other fevers," heatstroke, tonsillitis, rheumatism, and diarrhœa. Ague caused 64 per cent. of the total sickness. The chief causes of death were pneumonia and dysentery. Among the diseases which caused increased mortality were dysentery, malarial fevers, and pneumonia. Among those from which mortality was lessened were heatstroke, circulatory diseases, diarrhœa, small-pox, and enteric fever. Pneumonia caused 38 per cent. of the total deaths, and dysentery 17 per cent.

The health of the prisoners of Bombay was again bad, as compared with what it was in the previous year. The admission rate rose from 727 per 1,000 to 861, the constantly sick rate from 24 to 29, and the death-rate from 31·36 to 32·81. The chief causes of admission were ague, abscess, &c., respiratory diseases other than pneumonia, and diarrhœa. Among the diseases with raised admission rates were influenza, ague, simple continued fever, remittent fever, respiratory diseases, debility, and phthisis. Among those with lessened rates were cholera, small-pox, bowel complaints, scurvy, and rheumatism. Ague caused 34 per cent. of the total sickness. The chief causes of death were pneumonia, dysentery, and diarrhœa. Among the diseases which caused increased mortality were respiratory diseases, circulatory diseases, and remittent fever. Among those from which mortality was lessened were cholera, small-pox, and heatstroke. Pneumonia caused 22 per cent. of the total

deaths. As in the two preceding years, none of the fever cases occurring in the Bombay jails were returned as enteric.

There was more sickness among the prisoners of Berar than in the previous year, though the death-rate (18·16 per 1,000) was slightly reduced, and the jails were free from cholera. The chief causes of admission were ague and influenza. Among the diseases with raised admission-rates were influenza, spleen diseases, circulatory diseases, rheumatism, and eye diseases. Among those with lessened rates were simple continued fever, diarrhœa, dysentery, respiratory diseases, abscess, &c., and guinea-worm. Ague caused 33 per cent. of the total sickness, and influenza 24 per cent. The chief causes of death were dysentery and phthisis. Among the diseases which caused increased mortality were dysentery and phthisis. Among those from which mortality was lessened were malarial fevers, diarrhœa, and respiratory diseases. Dysentery and phthisis caused each 17 per cent. of the total deaths.

Sickness among the prisoners of the Central Provinces was increased, in great part, from the occurrence of epidemic influenza; while the death-rate was very greatly reduced (from 51·37 to 26·07) directly and indirectly by the total cessation of cholera. The chief causes of admission were ague, influenza, diarrhœa, dysentery and abscess, &c. Among the diseases with raised admission-rates were influenza, simple continued fever, scurvy, and rheumatism. Among those with lessened rates were cholera, "other fevers," bowel complaints, small-pox, and pneumonia. Ague caused 33 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, debility, and respiratory diseases other than pneumonia. Among the diseases which caused increased mortality were respiratory diseases other than pneumonia, and phthisis. Among those from which mortality was lessened were cholera, bowel complaints, all the fevers, pneumonia, and debility. Bowel complaints caused 30 per cent. of the total deaths.

That the admission-rate among the prisoners of Madras rose (from 698 in 1889 to 810), although the death-rate was much reduced (from 39·49 to 25·32), and the constantly sick-rate (28) remained steady, is due to the occurrence of influenza. The chief causes of admission were influenza, ague, diarrhœa, and dysentery. Among the diseases with raised admission-rates were influenza, "other fevers," malarial fevers, enteric and simple continued fevers, hepatic and respiratory affections, abscess, &c., rheumatism, guinea-worm and other entozoa. Among the diseases with lessened rates were cholera, bowel complaints, small-pox, phthisis, debility, and scurvy. Influenza caused 17 per cent. of the total sickness, ague 15 per cent., and diarrhœa 13 per cent. The chief causes of death were diarrhœa, dysentery, debility, cholera, and pneumonia. Among the diseases which caused increased mortality were respiratory diseases. Among those from which mortality was lessened were cholera, diarrhœa, dysentery, debility, small-pox, enteric fever, and malarial fevers. Bowel complaints caused 30 per cent. of the total deaths.

General Population.

General remarks on the vital statistics.

The highest mean provincial birth-rates were recorded by Berar, 42·5; North-western Provinces, 39·70; Punjab, 39·08; Bombay, 38·97; Central Provinces, 38·41; while in the remaining provinces it varied from 31·3 in Madras to 15·25 in Coorg. The number of males born to every hundred females varied from 114·88 in the Punjab to 104·2 in the Madras Presidency. The excess of births over deaths was greatest in Bombay where it was equal to 11·22 per 1,000 of the population. In Madras the excess was equal to 8·5 per 1,000; and in Berar to 7·1 per 1,000. There was an excess of deaths over births recorded in four provinces, viz., Bengal, Punjab, Mysore, and Coorg.

The highest death rates were recorded in the Punjab, 46·87; North-western Provinces, 37·27; Berar, 35·4; while in the remainder it ranged from 32·52 in the Central Provinces to 17·30 in Mysore. The rural exceeded the urban death-rate in Bengal, Central Provinces, and Berar. The difference between the rural and urban death-rates amounted to 21·08 in Lower Burma, and to 7·05 in Coorg. As regards

the death-rate from the different causes, that from "fevers" is by far the highest, in every province, and varies from 36·75 in the Punjab to 8·82 in Lower Burma. The death-rate from cholera varies from 3·40 in Assam to 0·03 in Coorg; that from small-pox varies from 1·26 in the North-Western Provinces and Oudh to 0·1 in Berar; while the death-rate from "bowel complaints" varies from 5·1 in Berar to 0·65 in Bengal.

The following statement shows the deaths recorded from all causes month by month in the different provinces:—

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1890.	1889.
Bengal	124,646	112,524	128,752	138,260	124,457	115,004	115,580	116,479	146,205	130,294	154,891	205,387	1,612,479	24·48	24·25
Assam	9,510	8,324	9,026	9,935	14,991	14,726	12,303	11,169	9,938	10,747	11,930	11,596	134,195	29·64	30·70
North-Western Provinces and Oudh.	100,299	94,263	105,716	150,611	166,701	127,759	102,930	131,541	183,107	188,382	154,751	137,967	1,644,027	37·27	31·11
Punjab	60,027	47,223	48,361	49,905	59,639	54,133	40,211	54,548	126,773	162,361	109,276	70,692	883,149	46·87	31·62
Central Provinces	19,849	17,475	20,476	30,576	33,499	19,772	17,094	23,121	27,579	29,077	25,857	22,399	286,754	32·52	43·79
Berar	6,149	5,408	6,673	11,745	7,915	4,777	6,446	9,723	11,026	9,458	7,369	6,331	93,020	35·4	42·5
Lower Burma	5,681	4,779	4,937	4,428	4,377	5,134	6,544	6,344	5,293	4,967	5,310	5,797	63,591	17·40	17·07
Madras Presidency	61,434	48,978	45,369	52,887	66,728	50,835	53,634	55,815	54,455	50,648	52,023	57,538	650,394	22·8	23·5
Bombay Presidency	37,540	33,506	43,825	51,527	35,565	29,518	35,207	39,828	36,992	39,219	41,931	38,958	463,616	28·18	31·51
Mysore	7,112	5,936	5,429	12,506	12,338	7,555	6,494	5,819	5,495	5,588	5,299	5,436	85,007	20·77	18·23
Coorg	308	240	230	391	926	510	369	412	314	273	276	266	4,515	25·32	22·92
Total	432,555	378,656	418,794	512,771	527,136	429,723	396,862	454,799	607,177	631,014	568,893	562,367	5,920,747		

In Bengal the registration of births was limited to 142 municipalities during the year. No improvement is evident in the resulting statistics, but on the contrary they appear to be even more inaccurate than in previous years. The average birth-rate in the selected area fell from 22·76 in 1889 to 21·54 in the year under review, while the extremes varied from a minimum of 1·57 to a maximum of 53·89, compared with 3·72 and 52·22 respectively in 1889. Deaths are registered throughout the province, and it is noticeable that, in their case, the records of the municipalities are evidently less trustworthy than those of rural circles; for while in the former the mortality varied from 6·49 to 82·19; in the latter the extremes were 14·24 and 40·08. While in 1889 the death-rates varied from a minimum of 16·02 per 1,000 to a maximum of 45·22, and yielded a mean rate for the province of 24·25, in 1890 they ranged between 14·62 and 40·34, with a mean provincial rate of 24·48. The Local Government in reviewing these statistics justly remarks that, comparing the birth-rate with the recorded death-rate of the year, the singular result is arrived at that, while the census of 1891 shows the population of Bengal to have increased during the last 10 years by more than 60 per 1,000, the municipal birth statistics prove it to be decreasing at the rate of nearly 3 per 1,000.

The total births registered in the North-western Provinces and Oudh during the year amounted to 1,751,168, equivalent to a birth-rate of 39·70 per 1,000, against 36·93 in the previous year. An examination of the returns from individual districts shows that this increase in the birth-rate is shared by 34 of the 49 districts of the province, but that the district birth-rates vary from a minimum of 24·46 to a maximum of 51·43. The recorded deaths in the provinces during the year numbered 1,644,027, or a ratio of 37·27 per 1,000, against 31·11 in the preceding year, while the individual returns from districts show a more or less greater mortality, compared with the previous year, in nearly all of them. The district death-rates varied from a minimum of 24·81 to a maximum of 54·97. The general results of the registration of vital statistics are considered by the Sanitary Commissioner to be approximately accurate, and the rough test applied by the Local Government in its review may be considered satisfactory as far as it goes. The description of this test is as follows:—
"A rough test of the accuracy of the general results of the registration of births "and deaths, in so far as the excess of births over deaths and therefore the increase "in population is concerned, is afforded by the figures of the preliminary abstraction

" made immediately after the recent census. The population at the beginning of " 1891, deduced by adding the excess of births over deaths in each year after 1880 " to the figures for the census of 1881 should, if registration of births and deaths " were accurate, agree with the population as shown by the census of 1891. Applying " this test it is found that the population in the beginning of 1891, calculated in the " manner indicated above, should have been 47,068,587, whereas the population as " shown by the recent census is 46,931,002. This close correspondence affords a " valuable confirmation of the general accuracy of your returns, and it is possible " that a part at least of the slight excess of the deduced population may be accounted " for by omissions at the recent census." This does not prove the correctness of the total births and deaths recorded, and there is much evidence that there is still room for improvement in individual registering circles. In the Dehra Dun district, for instance, the birth-rate is only 24·46; the death-rate 33·77; while 133·38 males are said to be born for ever 100 females. It may be noted also that as many as 22 out of the 49 districts show an excess of deaths over births.

In the Punjab the birth-rate fell from 40·28 per 1,000 in 1889 to 39·08 in the year under review. The death-rate rose from 31·62 per 1,000 in 1889 to 46·87 in 1890. The latter is the highest rate on record since registration was begun in 1868. This is also the first year in which the death-rate has exceeded the birth-rate, which it does by as much as 7·79 per 1,000. Apart from defective registration, the Sanitary Commissioner thinks that the excessive sickness which prevailed during the year, especially in September, October, and November, and which was often the cause of abortions, may have affected the births. This view is probable enough in itself, but is not borne out by the figures, for almost all the districts which suffered most from fever, and returned very high death-rates also returned very high birth-rates. The Sialkot district, for instance, which has the highest death-rate, 102 per 1,000, has also the highest birth-rate, 50 per 1,000. Moreover, in certain villages of the Delhi and Kurnal districts, which are situated on the Western Jumna canal, and which are notoriously unhealthy, the birth-rates do not appear to be at all affected by the high mortality of the year. Here the birth-rates increased from 43 and 40 in 1889 to 44 and 43 in 1890; in spite of the enormous increase in mortality, from 41 and 36, to 60 and 52 per 1,000 respectively. The excessive number of male births recorded in the frontier districts is instanced by the Sanitary Commissioner as a proof of defective registration in those districts. In Peshawar there were 166·94 male births recorded for every 100 female. In 1889 there were 19 districts which returned a higher death-rate among females than among males. In 1890 the number of such districts increased to 24, and the excess of female over male mortality rose from 1 to 2·79 per 1,000. Under the orders of the Lieutenant-Governor, special inquiries were made to ascertain the localities which return these abnormal female death-rates, and if possible to find out the cause of them. Nothing very definite seems to have been arrived at, but it is supposed that female infanticide is still practised in some parts of the province, and that female children are generally taken very little care of when ill.

Although the Central Provinces were free from wide-spread epidemics and the general health is said to have been good, the birth-rate fell to 38·41, which compares unfavourably with that of the three preceding years. The maximum in any district was 49·77, the minimum 31·95. All the districts except five returned an excess of births over deaths ranging between 1·20 and 17·77 per 1,000. The death-rate for the year was 32·52 compared with 43·7 in the preceding year, which, however, is an exceptionally high rate. All the districts except two shared this diminished mortality. The excess of male over female deaths was almost identical in the two years, viz., a fraction over 16 per cent. In the municipalities the ratios for both births and deaths are lower than in the province as a whole, including the rural areas, and this notwithstanding that a considerable number of persons have been fined under the municipal laws for neglecting registration. Compared with 1889 all the chief causes of mortality were less prevalent in 1890.

In Berar the year was a healthy one and comparatively free from epidemic disease, and the number of births was greater and that of the deaths less than in the preceding year. The birth-rate was 42·5 per 1,000, which is higher than the ratio of any of the preceding four years, while in the districts the maximum birth-rate was 46·9 and the minimum 40·0. There is evidence of defective registration in some of the

towns, the ratios in them ranging from 58·3 to 21·8, and there is also a wide range of variation between the maximum and minimum ratios in the returns from the different rural circles of the districts. Of males there were born, on an average for the province, 106·6 to every 100 females. In all the districts the births were in excess of deaths. The proportion of still to live births was 3·9 per cent. Still-born children are not registered in England, but the above figure corresponds closely with the proportions between still and live births given by Farr for France and Belgium, viz., 3·6 and 3·7 respectively. The death-rate for the province was 35·4 per 1,000 against 42·5 in 1889. All the districts participated in this decrease, the highest district death-rate was 40·9 and the lowest 29·8. In the province as a whole the mortality in the town circles was at the rate of 32·8 per 1,000, while in the rural circles it averaged 35·8. As in the case of the births there is much evidence of defective registration in towns.

The reported birth-rate for the Bombay Presidency during 1890 was 38·97 per 1,000 which exceeds the ratio for 1889 by 2·48, and the average of the preceding decennium by 6·25. The figures for individual districts show that this increase was distributed almost all over the Presidency, only four districts failing to participate in it. The birth-rates of the urban and rural circles also show some improvement, the ratios being 28·40 and 40·52 respectively, against 27·79 and 37·78 in 1889. Nevertheless it is stated that registration is distinctly defective in 17 out of the 24 districts. In most cases this defect was restricted to particular sub-divisions of the district, but in a few instances the imperfection obtained throughout the whole. The death-rate for the Presidency was 28·18 per 1,000, against 31·5 in 1889, and 25·43 the mean of the previous 10 years. This decrease was almost general throughout the Presidency, only six districts not participating. The Sanitary Commissioner states that in 13 collectorates the registration of deaths was either wholly or partially neglected; and how little reliance can be placed on these statistics is shown by the fact that in rural circles the death-rates varied from a minimum of 17·27 to a maximum of 41·02; while in towns they varied from 9·45 to 80·88. It may be noted that, while in 1889 the highest mortality occurred in August and the lowest in February, the highest in 1890 was recorded in April and the lowest in June. The proportion of still to live births for the whole Presidency was 0·91 per cent., but in the city of Bombay it was 8·34, compared with 8·02 in 1889, and in Kanara 4·12 compared with 3·87.

Though there has been a slight improvement in the registration of births in Madras, the average birth-rate for the Presidency having been 31·3, or 0·4 more than in 1889, it is evident that this ratio is susceptible of further improvement, judging from the results in individual districts, in 12 of which the birth-rate stood at a higher figure, while in 3 it exceeded 40 per 1,000. The maximum rate in any one district as a whole was 43·6, the minimum 18·2. The male birth-rate was everywhere greater than the female, and in the Presidency as a whole exceeded it by 0·7 per 1,000. The excess of births over deaths for the whole Presidency was 8·5 per 1,000. The death-rate fell from 23·5 per 1,000 in 1889 to 22·8 in 1890, the decrease being mainly due to cholera. Excluding Madras, in which the mortality (42·7 per 1,000) was as usual exceptional, the death-rates for districts ranged from 13·4 in Ganjam to 29·7 in Kurnool. The greatest increase in the mortality in any one district occurred in the Nilgiris, where it rose from 16·0 in 1889 to 24·4 in 1890, this increase appearing under the headings "fevers," and "all other causes."

In Coorg the registration of births is more defective than in the two preceding years, the ratio having fallen to 15·25 compared with 16·36 in 1889, and 16·61 in 1888. The death-rate was somewhat higher than in 1889, being 25·32 against 22·92, and this increase the Commissioner thinks should be attributed to influenza.

Although the registration of deaths has been in force in Lower Burma since 1871, and that of births from 1875, the results are still far from satisfactory. In the year under review the recorded birth-rate was 23·20 per 1,000, and this, though somewhat greater than in 1889, is less than that of 1888, which stood at 23·91, and not much higher than the ratio of 1875, when registration was just commenced. The death-rate per 1,000 was 17·4, against 17·07 in 1889, and 23·40 in 1888. Here again little progress has been made since the beginning of registration in 1871, when the mortality was returned for the first time and the ratio was 14·26 per 1,000. The birth-ratio in the different districts varied from 12·95 to 36·63, a variation which, as the Chief Commissioner remarks, may be attributed more to the different degrees of attention to rules paid by the officials concerned with the registration of births than to any of those

obscurer causes which affect the yearly supply of human beings. Special paid agents are kept up in 20 towns for registration purposes, and in these towns the births equalled on an average 20·57 per 1,000 and the deaths 29·74; but seeing that the former figure was made up of extremes varying from 13 to 51, and the latter of extremes from 17 to 39, these returns cannot be considered reliable.

The registration of vital statistics still continues to be defective in Assam. The birth-rate has steadily declined from 31·62 in 1888 to 30·56 in the year under review, the ratio for 1889 having been 31·20. All districts except Sylhet and Kamrup contributed to this decrease in the past year, the greatest falling off being in the Khasi and Jhaintia hills, Cachar, and Nowgong. The decline in the last district is partly accounted for by a severe epidemic of cholera and the increase of Kala-azar. The number of male births was greater than that of female births in all the districts, and for the province as a whole the excess of the former equalled 1·42 per 1,000 of population. The death-rate for the year was 29·64 against 27·78, the mean of the preceding five years. In three of the nine districts the death-rate was below the average for the province. In Sibsagar, Kamrup, and Nowgong, the mortality was unusually high, which is attributed to epidemic cholera, and, in the two latter districts, Kala-azar. The excess of births over deaths for the whole province was only 0·92 per 1,000 of population. The compulsory registration in *sadr* and sub-divisional towns is particularly defective. For instance, at Balaganj, a town of 2,769 inhabitants, there were no births recorded, and only four deaths. At Gauhati the birth-rate was only 7·18; at Silchar, 12·03; at Sylhet, 18·60; at Golaghat, 12·14; at Goalpara, 11·49; at Mangaldai, 10·13, and so on. Prosecutions were only instituted in four *sadr* and three sub-divisional towns, so that the term "compulsory," as applied to such registration, is evidently a misnomer.

It should be noted that in the above remarks the birth and death-rates quoted have in all cases been calculated on the population of the census of 1881. Had the population of the census of 1891, or an estimated population for the year, been used, the result of registration would appear still less satisfactory, except in Coorg, where the population has decreased. This is particularly the case in Lower Burma, in which province the population has increased by nearly 22 per cent.

History of Chief Diseases.

Cholera.

Cholera was again widely distributed in the year 1890. No province was exempt from epidemic cholera throughout the year, and the only large area that entirely escaped was the north-west frontier of the Punjab. There were only a few cases in the eastern parts of the Central Provinces and the coast districts north of Madras. The total number of recorded deaths from cholera was, however, only 297,443 which is very much less than in the previous year, viz., 428,923, though rather more than in 1888, viz., 270,408. The general distribution of the disease was very similar in the three years.

Annual Deaths from Cholera in India, 1877 to 1890.

Province.	Population.	Deaths from Cholera.													
		1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.
Bengal*	65,859,534	155,305	95,192	136,363	39,643	79,180	182,352	90,439	134,421	173,767	118,368	172,578	111,391	171,103	145,885
Assam	4,526,959	11,377	6,782	17,415	2,803	5,010	21,055	14,908	22,276	7,753	20,188	7,941	9,693	18,288	15,396
North-Western Provinces and Oudh.	44,107,869	31,770	22,221	35,892	71,746	25,865	89,372	18,160	30,143	63,457	34,565	200,628	18,704	48,494	80,295
Punjab	18,842,264	29	215	26,135	274	5,207	39	190	614	1,936	12	8,804	4,938	2,838	3,401
Central Provinces	8,817,185	3,418	40,985	27,575	330	9,140	11,932	16,235	149	21,868	16,679	12,576	921	22,588	4,787
Berar	2,620,273	842	34,306	223	1	3,404	3,573	27,897	87	3,683	976	14,396	305	10,925	847
Rajputana	†	60	2,393	918	—	197	1,327	797	1,297	1,695	173	2,612	32	6,923	2,746
Central India	†	926	8,047	2,734	299	581	1,562	1,740	1,018	4,624	290	8,868	191	3,344	3,132
Bombay	16,454,414	57,228	46,743	6,937	684	16,694	7,904	37,954	13,804	37,287	167	25,711	36,500‖	32,431	3,259
Hyderabad	†	7,414	6,696	6	—	1,721	150	1,947	2,479	1,387	499	2,831	2,057	1,128	—
Madras	28,522,313‡	357,430	47,167	13,296	613	9,446	23,604	36,284	75,476	58,109	12,417	28,359	158,677	76,020	35,288
Mysore	4,092,648	2,902	723	14	25	25	893	124	330	2,677	10	832	1,015	1,590	1,326
Coorg	178,302	§	49	—	—	3	31	—	—	—	—	3	2	9	5
Lower Burma	3,653,629	7,276	6,759	1,828	2,638	5,239	7,177	2,185	5,515	7,685	4,027	2,649	15,982	3,242	1,076

* Excluding Calcutta. † Population not known. ‡ Excluding Europeans and Eurasians.
§ Statistics not available. ‖ Including four deaths, the monthly distribution of which is not known.

Compared with the previous year, there was a considerable increase in the number of deaths in the North-Western Provinces, and a slighter increase in the Punjab, but in all other provinces a diminished number, and this was especially the case in the Central Provinces, Berar, and Bombay.

The next table shows the seasonal prevalence of the disease in the different provinces. The month of minimum prevalence was, as is often the case, February, and the diminished prevalence in November is not unusual; but the fall in July is somewhat remarkable. The sudden increase in December is mainly due to Bengal.

Statement showing the Deaths from Cholera registered in the different Provinces by months, during the year 1890.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population.	
														1890.	1889.
Bengal - - -	10,718	8,410	15,083	17,100	16,020	13,381	9,797	7,835	5,243	5,244	9,205	27,849	145,885	2·21	2·59
Assam - - -	536	586	954	1,798	3,927	3,631	1,236	654	181	384	635	874	15,396	3·40	4·04
North-Western Provinces and Oudh.	127	517	1,067	5,547	4,726	3,737	3,742	11,699	21,913	18,386	6,486	2,348	80,295	1·82	1·09
Punjab - - -	—	—	—	7	64	663	400	1,003	1,168	95	1	—	3,401	0·18	0·15
Central Provinces - -	—	19	229	650	889	1,105	316	498	598	461	20	2	4,787	0·54	5·96
Berar - - -	—	—	—	—	—	—	—	181	451	126	73	16	847	0·3	4·2
Lower Burma - -	77	92	101	126	115	170	97	89	52	46	44	68	1,076	0·29	0·89
Madras Presidency -	7,448	5,169	2,441	1,988	1,755	2,868	3,344	2,904	1,780	1,062	1,284	3,245	35,288	1·2	2·7
Bombay Presidency -	505	114	24	2	15	201	365	706	299	443	227	358	3,259	0·20	1·97
Mysore - - -	3	—	16	121	705	387	40	23	10	12	1	8	1,326	0·32	0·39
Coorg - - -	—	—	—	—	5	—	—	—	—	—	—	—	5	0·03	0·05
Total - -	19,414	14,907	19,915	27,339	28,221	26,143	19,337	25,592	31,695	26,258	17,976	34,768	291,565		

In the next table the ratio of the cholera mortality per thousand of population is compared with the mean of the ratios of the previous five years in the different provinces. The mortality in rural circles is also compared with that in towns, and the percentage of villages attacked is shown for each province.

Province.	Mortality in 1890.	Mean Mortality of previous Five Years.	Urban Mortality.	Rural Mortality.	Per cent. of Villages attacked.	Maximum Mortality in Rural Circles.	Maximum Mortality in Towns.	Month of Maximum Prevalence.
Bengal - -	2·21	2·24	2·97	2·18	9·4	8·45	27·95	December.
Assam - -	3·40	2·82	3·21	3·41	19·4	11·49	20·96	May.
North-Western Provinces and Oudh.	1·82	1·65	1·91	1·81	6·3	13·84	27·71	September.
Punjab - -	0·18	0·30	0·51	0·15	0·8	1·34	15·29	September.
Central Provinces -	0·54	2·37	0·39	0·56	2·1	4·31	15·48	June.
Berar - -	0·3	2·3	0·1	0·4	1·5	0·6	1·0	September.
Lower Burma -	0·29	1·84	0·72	0·24	2·6	0·96	5·67	June.
Madras - -	1·2	1·6	3·3	1·1	9·4	3·0	28·8	January.
Bombay - -	0·20	1·61	0·19	0·20	1·5	1·03	3·39	August.

This shows that the incidence of the disease was greatest in Assam, where it was still much above the mean of the previous five years, though less than in 1889 (4·04). In Bengal, the North-West Provinces, and in Madras, the mortality is not much removed from the five-year average, while in all other provinces it is well below it. The percentage of villages attacked was also much greater in Assam than in any other province. The heaviest mortality in any one town is shown by Madras, closely followed by Bengal and the North-West Provinces.

In Bengal, cholera caused in all 145,885 deaths, or 2·21 per 1,000 against 171,103, or 2·59 per 1,000 in 1889. The average for the previous five years was 2·24, and for the previous 10 years 1·90 per 1,000. The disease was present in all districts of the province almost throughout the year, but those which suffered most were Faridpore, Bhagalpore, Chumparun, and Dacca. The months of least prevalence were September

and October, while the greatest prevalence was in December; but on the whole the mortality was greater in the first half of the year.

In the town of Calcutta there were 963 deaths from cholera, a lower figure than in any previous year except 1871, in which there were 796 deaths, and 1880, 805 deaths. The Health Officer attributes the improvement to the increased water-supply introduced in 1889, and this view is supported by the fact that the reduction in the mortality from cholera is very marked in certain quarters of the town in which the water-supply had before been particularly defective. A remarkable outbreak occurred in the fortnight, 31st of January to 13th of February, during which period there were 178 deaths. This coincided with a marked change in the weather.

Amongst European seamen in the port of Calcutta there were 15 admissions and 14 deaths from cholera. The admissions were fewer than in any previous year on record, and the mortality less than in any year except 1885. The death-rate was 8·33 per 1,000 of the daily average strength, and 0·71 per 1,000 of the total arrivals in port. Of the 15 admissions seven were from six ships in port, one was attacked while in hospital for another disease, and the remainder came from different parts of the town. There was nothing peculiar in the history of any of the patients just before the attack, except that two of them had been drinking hard. The death-rate from cholera among the Native population of the port was 2·14, a lower rate than in any recent year except 1887.

In Assam the deaths from cholera in 1890 amounted to 15,396 or 3·4 per 1,000 of population. The death-rate from this cause in the Surma valley was, however, only 1·63, against 4·99 in the previous year, but rose to 5·25 in the Brahmaputra valley, from 3·15 in 1889. The incidence of the disease was therefore much greater in the latter, and was especially so in the Sibsagar district, in which 4,289 deaths occurred, or about 28 per cent. of the total deaths in the whole province, and the death-rate per 1,000 from cholera was 11·58. The Sanitary Commissioner believes that the disease was introduced into this district by a batch of coolies brought up to a tea garden near Sibsagar, basing this view apparently on the fact that the disease first showed itself among these particular coolies, but there does not appear to be any reason for snpposing that they were infected before their arrival in the district.

The total number of immigrants into Assam was 35,798, which is considerably less than in 1889, viz., 55,149. In the case of the Brahmaputra valley, 13,257 immigrants came into the province viâ Dhubri, and 11,479 by steamer from Goalundo. The casualties among these, after they had entered the province, were 22 from cholera, and 15 from other causes, which compares very favourably with the figures for 1889, viz., 374 and 57 respectively. The number of coolies coming in by steamer from Goalundo, instead of by the railway route viâ Sara and Kaunia to Dhubri, has very much increased in the year under review. On this matter the Civil Surgeon of Dhubri remarks: "Personally, I think the longer steamer journey will prove a mistake in "cholera seasons, especially so when we have brisk immigration seasons, for I think "no one will doubt but that the longer large numbers of human beings are cooped "up or collected in small space, the greater is the possibility of cholera occurring. "Again, Goalundo, if I mistake not, is in the so-called endemic area of cholera, and "the immigration reports during the seventies will show that cholera was very preva-"lent on board steamers. The journey from Goalundo to Dibrugarh now occupies "seven days, nearly double the time it does from Dhubri, and is only about half "what it was in the days of the big steamers. By the Kaunia route, if the coolie is "looked after *from* the recruiting districts *to* Raneeganj, I think the good food, cleanly "depôts between Raneeganj and Dhubri, the different changes *en route*, the avoidance "of being cooped up on a steamer for very many days at a time, will all tend to make "the Raneeganj Kaunia-Dhubri route a more favourable one, so far as the health of "the coolie is concerned. This, however, is a question that time alone can decide."

Of the 11,529 immigrants to the Surma valley we only have information regarding their health in the case of the 3,305 who used the depôts. Among these, 21 died of cholera, and 16 from other causes, on the way up, against 121 from cholera, and 134 from other causes, in 1889. On this side a large number of the coolies still proceed by country boat, if not the whole way from Goalundo, at least from Fenchuganj onwards, in preference to travelling by the steamer service. From the health point of view it is very desirable that more should take advantage of the steamers.

The total number of deaths from cholera in the North-Western Provinces and Oudh was 80,295, which gives a death-rate from this cause equal to 1·82, as compared with

a total of 48,494, and a death-rate of 1·09 in the previous year. In the record of the past 20 years there are only two, 1882 and 1887, in which this rate has been exceeded. All districts suffered except Lalitpur; in Kheri and Pilibhit the mortality exceeded 10 per 1,000; in Moradabad, Shahjahanpur, and Bahraich it was over 5 per 1,000; while in seven other districts it was over 2 per 1,000. Of the 99 towns in the provinces, 29 escaped from cholera altogether, but the mortality in five exceeded 10 per 1,000, viz., in Khairabad, 27·71; Amroha, 20·83; Sherkot, 17·56; Pilibhit, 14·03; and Sitapur, 10·57. The year was also characterised by sudden, severe, and very fatal epidemics at Ranikhet, Naini Tal, and Mussoorie. At these hill stations all classes were attacked, though chiefly hill men. There was also a sudden and fatal outbreak in one of the Goorkha battalions at Dehra Dun.

In the Punjab there were 3,401 deaths from cholera in 1890, or a death-rate of 0·18, as compared with a total of 2,838, and a death-rate of 0·15, in the previous year. Of the 31 districts in the province, 20 returned deaths from cholera, but it was only in two districts that the mortality exceeded one per 1,000. The first death from cholera occurred in the Hissar district on the 11th of April, but during this month the disease was confined to three districts, and the total number of victims did not exceed seven. In the next month, May, there were 64 deaths, but the bulk of these occurred in Delhi. In June the disease became more general, breaking out epidemically in many districts, and it continued to prevail with more or less severity in many parts of the province until November.

The Sanitary Commissioner attributes the rapid distribution of the disease throughout a large portion of the province to the agency of railways and pilgrims.

There were 4,787 deaths from cholera in the Central Provinces, or a ratio of 0·54. This is very much less than in the previous year, when the total was 52,588, and ratio 5·96, though greater than in the years 1888, 1884, and 1880. But though the incidence was light, the disease was widely distributed, and only one district escaped entirely. Of the 160 registration circles, 80 reported cases of cholera. The only district that suffered severely was Narsinghpur, where the death-rate from cholera was 4·23, while in the districts of the Mahanadi division, and some districts of the Wainganga division, there were only a few isolated cases. The disease commenced with a few sporadic cases during February in the Murwara and Sambalpur districts; but in March became epidemic in Narsinghpur and subsequently in other districts. The maximum prevalence was in June, and the minimum in December. The opinions of the different civil surgeons regarding the origin of the disease in their districts are very various.

In 1890 cholera occurred in five out of the six districts in Berar; 84 villages suffered, and 847 persons died of it. The incidence of the disease was very much less than in the previous year, when all the districts were affected; 817 villages suffered, and 10,925 persons were carried off. The ratio of mortality from cholera in 1890 was 0·3 per 1,000, against 4·2 in 1889, and 2·3 the average of the previous five years. Until August the disease was entirely absent from the province, but early in that month it began almost simultaneously in the Buldana and Amraoti districts, and towards the end of the same month it appeared in the Basim and Wun districts. In September it was confined to these four districts, but had increased in severity. In October it appeared also in the Akola district, but in a mild form, and the disease had everywhere begun to decline. In December it had almost disappeared, only 13 deaths being reported from Basim, and three from Akola. The Ellichpur district was free from cholera throughout the year.

In the Bombay Presidency there were 3,259 deaths from cholera in 1890, or a death-rate of 0·20, as compared with a total of 32,431, and a death-rate of 1·97 in 1889. Excepting six districts, the disease was present throughout the whole Presidency; but about one-third of the total deaths occurred in the Satara district alone, and there were 809 deaths in the Belgaum district. Only 1·5 per cent. of the villages returned deaths from this cause. The disease was present throughout the year, though it nearly died out in April, in which month only two deaths were recorded. The maximum was in August. In the town of Bombay there were 100 deaths from cholera, or a death-rate of 0·13 per 1,000.

In the Madras Presidency during 1890 cholera caused 35,288 deaths, or a ratio of 1·2 per 1,000. This is 40,732 deaths less than in 1889, in which the ratio was 2·7, and 2,612 less than the mean of the deaths from this cause in the past 10 years. The disease was present throughout the year, subsiding somewhat in March, April, and

May, and again in August, September, and October, but increasing in June and July, and again in November and December. There was no cholera in the Bellary, Godavari, and South Canara districts; and very little in the Nilgiris, Vizagapatam, and Kistna districts. The districts which suffered most severely were the southern districts of Tinnevelly, Madura; and Tanjore, in which the ratios per 1,000 of the population were respectively 3·4, 3·1, and 2·6. Of the total villages in the Presidency 9·4 per cent. were affected by cholera. In the town of Madras there were 687 deaths from cholera, or a ratio per 1,000 of 1·7.

In Lower Burma the deaths from cholera were fewer than in any of the preceding 14 years. The Arakan division was again almost free from the disease, while Thongwa and Bassein, which suffered severely in 1889, again furnished the highest ratios in 1890. The total number of deaths from this cause was 1,076, and of these nearly two-thirds occurred in the first half of the year. The disease was more or less prevalent in all districts excepting Kyaukpyu and Sandoway. In the town of Rangoon there were 98 deaths, or a ratio of 0·73 per 1,000.

The following is a brief review of the cholera reports received from the medical officers of regiments and jails, set forth under the same headings as has been done for many years in this report.

In several instances among European troops the first, and often the only, patient attacked had been in bad health previously. Thus two were debilitated and anæmic from chronic malaria; two had been ill for some time from influenza; one was in hospital with melancholia; another with gonorrhœa; and so on. In two instances the patient had recently made a long journey in extreme heat, and when he was already in indifferent health. Two officers who were out of sorts, the one with diarrhœa, the other with anorexia, lassitude and nightly fever, attended and rode in a race at a gymkhana, and were attacked with cholera a few days afterwards.

In the case of Native troops fatiguing journeys and surfeits of indigestible food are commonly mentioned as precursors of the attack.

In the jail reports such remarks are more rare. One was in hospital with chronic dysentery, another with malarial cachexia. Two had just come off long journeys. Exposure to heat in out-door work is mentioned once, and dietetic errors in two cases.

Among European troops, diarrhœa was more or less prevalent during 9 out of 24 outbreaks of cholera. Among Native troops it was prevalent in 11 out of 34 outbreaks. In jails we are told in 10 instances that diarrhœa, or epidemic diarrhœa, or unusual diarrhœa, was prevalent. In six cases there was some diarrhœa, but nothing unusual. In 15 instances there was none.

In British cantonments, in the 20 outbreaks for which the particulars are given, there were attacks of cholera in 62 buildings out of a total of 410 occupied, or 15 per cent. For Native troops particulars are given in 23 instances in which attacks occurred in 160 buildings out of 5,032 occupied, or 3·18 per cent. In jails attacks are reported from 101 buildings out of 410 occupied, or 24·6 per cent.

As usual, every variety of weather is noted as an accompaniment to the different outbreaks. In some cases there was great heat, in others the air was unusually cool. Some outbreaks ceased with the fall of heavy rain, others immediately followed a similar fall. The air is said to have been hot, still, and muggy in a good many cases; but in others it was dry, or there was a strong wind blowing.

In the majority of cases nothing is said of any communication between the first case and the previous cases in the bazar. At Bareilly, people from affected villages were coming into the lines and bringing in meat for sale; and it was after a heavy meal of this meat that the first cases were attacked. In another regiment in the same station there was a severe epidemic at the time in a village close to the lines and with which there was constant intercourse. In the 2/2 Goorkas the first man attacked had run up against a cholera corpse, belonging to the other battalion and being carried away for burial, in the dark. He received a severe nervous shock and was much upset. He was attacked with cholera the same night. At the Arrah jail the first case had been outside the jail picking grass in the morning, and while so employed a cholera corpse was carried past within a few feet of him. In other cases it is mentioned that the first case, or cases, had previously been in some locality where cholera was prevalent.

Attendants attacked.—Among European troops 75 cases of cholera were attended by 274 persons, and of these two, or 0·73 per cent., were attacked with the disease. The medical officer at Ranikhet was living in a house where other cases had occurred,

and probably owes his illness to that fact rather than to attendance on the sick. At Madras a warrant officer was attacked six days after attending to a case of cholera on its admission into hospital, but the disease was prevalent at the time in the town.

Among Native troops 386 cases of cholera were attended by 638 persons, of whom 26 were attacked with the disease, or 4·07 per cent. At Dharmsala there were 241 cases and 183 attendants, of whom 22 were themselves attacked. The circumstances connected with any of the attacks were not such as to lead to the conclusion that they were due to attendance on the sick.

In jails 212 cases were attended by 294 persons, of whom 10 were themselves taken ill, or a ratio of 3·4 per cent. At the Goalpara lock-up the sweeper who removed the excreta of the first case was himself attacked and made the second case. At Arrah jail four attendants were attacked out of 15 on 29 patients. One was a sweeper and the other three ordinary attendants.

These results are brought together in the following table :—

Communities.	Number of Cases of Cholera treated.	Medical Officers, Hospital Assistants, and other Attendants on Cholera Cases.		Percentage of Attendants attacked.
		Number.	Number of these attacked.	
European troops	75	274	2	0·73
Native troops	386	638	26	4·07
Jails	212	294	10	3·40
Total	673	1,206	38	3·15

Sanitary defects.—In the majority of the cantonments it is said that there are no sanitary defects, but there are a few exceptions. At Chaubuttia the water-supply is doubtful and subject to accidental contamination. At Naini Tal the water-supply is not above suspicion, as it is derived from the lake into which the drainage from the hill-sides flows. At Madras the general state of the town was at the time insanitary. At Dehra Dun the only defect was in the water-supply, which was from the Tons river. The source of this river is below the sewage depôt of Mussoorie, and it is open to contamination in its whole course. At Dharmsala the cantonment is below the Kotwali bazar and the water is liable to contamination. At Indore the drainage is defective. At Vellore the drainage is defective, and the condition of the town unsatisfactory. At Rawalpindi the men of the 15th Sikhs were found to have been drinking water from a dirty tank. At Alipore the presence of foul tanks in the lines and the vicinity is noted.

From jails we are told that at Culna the water of the well was muddy; at Serajgunge the well-water was foul; at Gauhati water was not sent out with the extra-mural gangs, and they resorted to tanks near the place where they worked; at Midnapur the water-supply was insufficient and of suspicious quality. At Dharmsala an open water-channel passed through the infected bazar and into the jail. Drainage was defective at the Lucknow jails. There was overcrowding at Alipore and Meiktila. At Arrah jail the water is impure, and there is a cemetery close to the well. Defects in buildings are noted at Nowgong and Maubin.

Movement into camp.—Among European troops there are only two instances of fresh cases of cholera occurring after movement into camp, both at Lucknow. At this station the troops moved into camp in 12 parties, and in one of these there was one case after the first move, in another three. The latter party was moved again and no more cases occurred.

Among Native troops 11 communities moved into camp on account of cholera. In five of these there were fresh cases in camp. At Dharmsala the 1/1 Goorkhas moved out into three camps. In one of these there were 17 cases in the first 24 hours after removal, but none subsequently. In another camp there were six cases in the first 24 hours, 29 in the second, but none afterwards. In the third camp there were no fresh cases, though in the party which went into this camp there had been 57 cases before removal. In the 1/2 Goorkhas at Dehra Dun there were three fresh cases after the first move in one camp, but there was only one in the other camp. Two fresh

cases occurred in one of the camps of the 42nd G. L. I., at Dibrugarh, and one in the camp of the 25th Bo. L. I. at Indore.

From jails, 11 communities moved into camp, and there was no more disease in seven of them after removal. At Arrah there were four cases in one of the camps. At Lucknow there were three cases in one of the four parties into which the jail community had been divided. There was one case in each party at Sitapur. At Rangoon there was one case in camp.

The general health in the camps was in all cases satisfactory.

Small-pox.

The number of deaths from small-pox in the whole of India decreased in the year under review. The decrease is not, comparatively speaking, very great, but is so far satisfactory that the disease had been steadily increasing since 1886. The following table gives the particulars for the different provinces:—

Statement showing the Deaths from Small-pox registered in the different Provinces, by months, during the year 1890.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1890.	1889.
Bengal	645	1,100	2,202	2,410	1,748	1,501	835	477	371	278	286	766	12,619	·19	·13
Assam	59	66	140	282	246	168	106	94	47	45	77	151	1,401	·31	·49
North-Western Provinces and Oudh.	1,656	3,024	6,783	10,520	11,176	9,424	6,524	3,054	1,180	550	471	1,032	55,394	1·26	1·09
Punjab	617	768	1,063	1,214	1,454	1,525	829	449	247	264	200	292	8,922	·47	0·42
Central Provinces	245	270	330	311	224	241	281	128	59	50	33	98	2,265	·26	1·99
Berar	50	76	82	41	32	12	11	5	4	2	3	6	324	·1	·7
Lower Burma	498	641	758	602	446	241	158	142	47	52	50	58	3,693	1·01	·77
Madras Presidency	2,949	2,894	3,194	2,277	1,916	1,596	2,056	2,241	2,252	2,190	2,001	2,517	28,092	1·0	1·0
Bombay	509	571	557	384	254	177	114	70	58	59	48	76	2,877	·17	0·43
Mysore	552	493	478	411	308	344	346	322	234	203	235	287	4,233	·86	1·28
Coorg	—	2	—	7	2	1	1	3	4	5	3	6	34	·19	0·10
Total	7,780	9,905	15,607	18,409	17,806	15,230	11,261	6,955	4,503	3,707	3,407	5,284	119,854		

In Bengal the mortality from small-pox still continues to increase, and it was greater in 1890 than in any year since 1884. The districts that returned the highest death-rates from this cause were Pooree, Chumparun, Midnapur, Patna, and Howrah. The mortality appears to be greater in towns than in villages. In many parts the people are very much opposed to vaccination, but in others the fault lies with the vaccinators. In the North-Western Provinces the disease has also increased somewhat, but there has been no such epidemic as there was in 1883–84. The continued diminution in Assam is satisfactory and is contributed to by all districts except Cachar, Kamrup, and Goalpara. The figures are still high in the Sylhet district, which is explained by the continued prevalence of the practice of inoculation. In the Punjab the mortality from small-pox, though slightly greater than in the previous year, was considerably less than the average of the last five years. There was a very satisfactory diminution in the deaths from small-pox in the Central Provinces, and the mortality from this cause has not been so low since 1881. In Berar the deaths from small-pox were less than one-fifth of the number in 1889. Great fluctuations occur from year to year but the Sanitary Commissioner is able to prove by figures the utility of vaccination in checking the disease. In Madras there has been a slight diminution, but the death-rate is still high, and is especially so in the South Arcot district, viz., 4·5 per 1,000. In Lower Burma there has again been a slight increase in the number of deaths from small-pox and the death-rate is very high. The district which suffered most was Prome, with a mortality of 4·53 per 1,000, while Akyab, Tavoy, and Mergui entirely escaped. The diminution in Mysore is satisfactory. In all provinces a very large proportion of the deaths occur among children under 12 years of age, and there is therefore good ground for supposing that much loss of life would be averted if vaccination could be more extensively practised.

Fevers.

There has been a considerable increase in the mortality from fevers, the total deaths in 1890 amounting to 4,105,890 compared with 3,524,763 in 1889, and 3,371,487 in 1888.

Statement showing the Deaths from Fevers registered in the different Provinces, by months, during the year 1890.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population.	
														1890.	1889.
Bengal - -	88,582	80,644	88,804	96,877	87,135	79,661	81,066	83,722	110,976	98,578	117,607	141,917	1,155,569	17·54	16·72
Assam - - -	5,329	4,819	5,131	5,118	7,513	7,575	7,428	6,641	6,091	6,273	6,635	6,226	74,779	16·52	16·15
North - Western Provinces and Oudh.	81,041	74,313	79,647	112,380	129,021	93,770	71,076	89,273	130,384	142,533	125,696	115,187	1,244,326	28·21	23·10
Punjab - -	44,631	33,055	33,847	35,837	44,506	39,554	27,270	37,689	104,603	141,884	92,739	56,806	692,511	36·75	22·75
Central Provinces -	13,058	11,462	13,561	21,916	24,566	12,741	10,531	14,059	17,546	19,490	17,714	15,244	191,888	21·76	23·03
Berar - -	2,980	2,646	3,627	7,971	4,971	2,302	2,819	4,007	5,902	4,592	3,690	3,287	47,894	18·2	17·9
Lower Burma -	3,122	2,394	2,300	2,109	1,959	2,448	3,197	3,228	2,890	2,552	2,873	3,250	32,232	8·82	8·30
Madras Presidency	21,811	17,640	17,453	25,321	35,038	22,286	20,632	20,409	20,911	19,291	20,361	21,702	262,855	9·2	8·2
Bombay Presidency	26,946	24,674	34,097	42,786	27,493	20,962	24,309	26,992	25,774	28,733	32,637	29,554	344,897	20·96	21·08
Mysore - - -	4,215	3,489	3,232	9,860	9,229	4,819	3,927	3,434	3,254	3,282	3,112	3,249	55,102	11·21	10·18
Coorg - -	259	205	191	328	816	455	318	348	251	210	236	220	3,837	21·52	18·35
Total -	291,974	255,341	281,830	360,503	372,247	286,573	252,573	289,807	427,592	467,418	423,300	396,732	4,105,890		

The only provinces that have not contributed to this increase are the Central Provinces and the Bombay Presidency. The increase is probably to be accounted for in part by deaths from influenza and its sequelæ being recorded under this head.

In Bengal there were 1,155,569 deaths from fever, or an increase of ·82 per 1,000. This is attributed to increased rainfall, excessive floods, and the inclusion under this head of the deaths from influenza; but the Sanitary Commissioner remarks that, "It "will be observed that the number of deaths and the death-rate per 1,000 of the "population were higher in 1890 than in any of the previous 16 years with which "that year is compared, and that, with the exception of one or two years, there has "been a steady increase year by year in the number of deaths recorded from this "disease. No doubt this result is to some extent due to better registration in the "present day, but there can be no doubt that it is also due in a great measure to "greater saturation of the soil with moisture, which is caused by the want of proper "drainage to carry off the subsoil water—a matter that is year by year becoming "more serious owing to the development of roads and railway communications, which "are acting as obstructions to the natural drainage of the country, because sufficient "waterway is not always provided in them. *Bunds* are also largely responsible for "the water-logged condition of the country, as their action is to raise the surrounding "land, and thus to imprison the drainage of the bunded area, which, finding no means "of escape, sinks into the soil and causes an amount of saturation which produces "malaria. The action of fishing weirs in rivers, which is a growing evil in Bengal, is "also responsible for obstructing the natural drainage of the country by stopping the "free flow of the water and causing the river to silt up above the weirs, and thus "eventually to degenerate into a series of stagnant pools."

In Assam the deaths from fevers have increased from 73,124 in 1889 to 74,779 in 1890. This increase is not contributed to by the Surma Valley districts, but is peculiar to the Brahmaputra Valley, and it is believed to be due to the increase in the disease known as "Kala-azar."

In the North-Western Provinces the deaths from fever increased from 1,018,928 in 1889 to 1,244,326 in 1890, and the death-rate from 23·10 to 28·21. Twenty-four districts recorded death-rates above 30 per 1,000 of the population, the highest rates, 47·79, 44·32, 42·79, and 39·64 being returned respectively by the Tarai, Muzaffarnagar, Saharanpur, and Meerut districts. It is remarkable that over 97 per cent. of the total deaths in the last-named district were ascribed to this cause, a fact which may serve to emphasise the doubtfulness of the statistics under this head. About 58 per cent. of the total increase under fevers occurred in the first half of the year, when influenza was prevalent in the province.

In the Punjab there were 692,511 recorded deaths from fevers, which is the highest number in any year on record. The nearest approach to this figure was in 1879, when

there were 472,939 deaths from this cause. This increase is attributed partly to the abnormal rainfall and partly to influenza. In all districts except Delhi and Gurgaon the mortality exceeded the mean of the previous five years, but it was most excessive in the Sialkot, Gujrat, and Gujranwala districts. The Sanitary Commissioner is of opinion that the majority of the deaths recorded under the heading Fevers during September, October, and November were really of malarial origin.

In the Central Provinces the death-rate from fevers in 1890 was 21·76 per 1,000, against 23·03 in 1889 and 19·91 the mean of the previous five years. There is a slight increase in the deaths from this cause in five districts. The total, no doubt, includes a large number of deaths from influenza. The results of the inquiries made by civil surgeons seem to show that about a fourth of the deaths from bowel complaints and other causes are returned under fevers.

In Berar the deaths from fevers increased from 47,104 in 1889 to 47,894 in 1890. By far the largest number in any one month was returned in April, whereas September is usually the month of maximum prevalence in this province, and this is, no doubt, to be explained by the presence of influenza in that month, though the Sanitary Commissioner makes no mention of it.

In Bombay the mortality from this cause was slightly less than in 1889, though still much above the average of the previous 10 years. The maximum in this province was also in April, but a certain proportion of the mortality in this month is probably due to influenza.

In Madras there were 262,855 deaths from fever in 1890, compared with 230,172 in 1889, and 223,212, the mean for the previous five years. In all districts except Ganjam and Vizagapatam, the death-rate was higher than in the previous year. The diseases recorded under this head were less prevalent in town than in rural circles, the death-rate for the former being 6·5 and in the latter 9·4 per 1,000 of population. The excessive mortality under this head is attributed by the Sanitary Commissioner to the epidemic of influenza.

In Coorg the death-rate from fevers was 21·52 per 1,000, as compared with 18·35 in 1889 and 16·02 during the previous five years. The reporting civil surgeon attributes the whole of the excess to influenza.

In Lower Burma fevers were more prevalent than in the preceding year, the deaths having risen from 30,343 in 1889 to 32,232 in 1890. The districts most affected were Thayetmyo, Akyab, and Sandoway. The months of greatest prevalence were December, August, July, and January. No mention is made of influenza as affecting the record under this head.

Influenza.

It is clear from the above that influenza was prevalent in all parts of India in the early part of the year under review, and that it increased considerably the death-rate among the general population. As regards the date of its appearance and its origin, the information afforded by the provincial sanitary reports is generally very scanty; indeed, in some of the reports the disease is not mentioned. As has been already mentioned, there was an outbreak of influenza in the Thayetmayo jail in August 1889, but the earliest notice we have of the epidemic in the general population appears to be at Orai in the Jalaun district of the North-Western Provinces, where it prevailed from the middle of January till June. In the Bijnor district of the same provinces influenza was very prevalent in the several towns of the district from February to July. In many other districts it does not seem to have appeared until March or even April.

The town of Calcutta was attacked by influenza early in February, and soon after a very large proportion of the inhabitants was disabled by it, as many as 50 per cent. of the inmates of some of the large crowded houses in the native town being affected with it, while in some cases offices had to be closed, so many of the employés were absent from this cause. The Health Officer says that the disease was clearly imported from Bombay, and was brought to Calcutta by merchants who have places of business in both towns, but it is not clear on what this conjecture is founded, as the disease also broke out in Bombay early in February, so that it might probably with equal truth be assumed that the disease was imported from Calcutta to Bombay.

The Sanitary Commissioner of Bengal describes the disease in the following words:—"This disease, which is believed to have been imported from Europe, spread

" rapidly in India, and was found to be a distinct and well-characterised disorder, " becoming rapidly infectious. It was ushered in in most cases by high fever, and " was almost harmless to people in good health and to those whose circumstances " permitted them to lie up comfortably during the attack, but highly dangerous and " fatal to those who had to expose themselves out of doors in the pursuit of their " ordinary avocations. Several cases of consecutive pneumonia came under notice " among the police, and such cases were also seen among the patients in charitable " dispensaries. There was great variety in the form of attack—a circumstance which " led one to perceive plainly the fact that diseases are made up of two factors, viz., " the *materies morbi* and the patient or pabulum of the disorder. In some cases " catarrhal symptoms, commonly a species of tracheitis or bronchitis of the larger " tubes, were the prominent trouble; in others different forms of neuralgia prevailed; " in many high fever and rapid recovery were the rule, and in many a debility lasting " for three weeks or a month was the chief trouble. With care and suitable treatment " the disease was brought to a successful termination in most Europeans and well-to-do " natives, but amongst the poorer classes and those who had to expose themselves, " there was a high mortality, pneumonia of the catarrhal variety being the usual " cause of the death. There were many cases also of a kind of hæmorrhagic catarrh " or bronchitis." It does not appear, however, that the malignant form of the disease was common, as no mention of it is made in other reports.

In the Punjab the disease prevailed widely in March, April, and May, and a considerable number of deaths was due to it or its complications. In Coorg also it was prevalent in the same three months, and though the proportion of deaths to attack was not great, the total mortality was considerable, owing to the large number of persons attacked. In Madras it prevailed from March to June. The Sanitary Commissioner says that it was supposed to have been introduced by direct contagion from parcels, letters, &c., but that this view is not borne out by the facts.

Kala-azar in Assam.

During the year Surgeon Captain G. M. Giles was deputed to Assam to inquire into the nature of the disease known as kala-azar, which has prevailed for some years, and caused great mortality, in the Goalpara, Nowgong, and Kamrup districts especially. The results of his investigations have been embodied in a report, in which he shows that this kala-azar is only another form of anchylostomiasis, that is to say, is due to the presence of a parasite, the *Dochmius duodenalis* (or *Anchylostomum duodenale*) in the intestines of the victims.

The Sanitary Commissioner is satisfied that the view taken by Surgeon Captain Giles is the correct one, and that both kala-azar and beri-beri are due to this parasite, the difference between the diseases being the outcome of malarial complications in the former. Preventive measures based on this view of the disease have been instituted in certain of the most affected villages, and if found to be effectual will be extended to all the affected localities.

Typhus and relapsing fevers in Baluchistan.

Another very interesting inquiry was made by Surgeon Captain Pisani into the nature of an outbreak of a very fatal and evidently infectious fever which occurred amongst the coolies working on the Chaman extension railway in Baluchistan during the winter of 1890–91. The mortality from the disease was at one time most alarming; in one instance a whole gang of men, except about 5 out of some 45, succumbing; while in another of the lines occupied by Pathans the mortality was roughly estimated at 40 or 50 per cent. The disease more particularly attacked the Pathans, who, of all the persons on the works, were the dirtiest in their habits. The exact mortality cannot be stated, but the Superintendent of Works estimates that, between the 1st of November 1890 and the 31st of March 1891, as many as 800 coolies died. The infectious nature of the fever is shown by the heavy mortality amongst the hospital establishment, for, while in 1888 and 1889 there was only one death in each year among the hospital subordinates, in 1890 there were nine deaths, and in 1891, up to April only, six deaths among them. As regards the nature of the disease, it is believed to have been partly typhus and partly relapsing fever. The great mortality was probably due to the former, but the presence of the latter is proved by the discovery of the *Spirillum Obermeyeri* in as many as 57 cases, and in 34 other cases the course of the fever and other symptoms were characteristic of that form of fever. This refers to observations made by Surgeon Captain Pisani, who, it must be noted, only arrived on the scene on the 19th of April 1891. As regards the origin of the disease it is remarked: " It is impossible to say whether the disease was imported or " whether it originated in the Khojak. Without any particulars as to the way in

" which the disease originated, and with workmen continually arriving from various " parts of India and beyond India, it would be impossible to say that the disease had " not been introduced from elsewhere. On the other hand, if the '*de novo*' origin of " the sickness is considered, and I am inclined to believe that in the present instance " the disease so originated, all the factors necessary for the production of typhus and " relapsing fevers have existed, namely, overcrowding, want of cleanliness, and to " some extent destitution."

Bowel complaints.

The recorded deaths from bowel complaints in 1890 amounted to 229,588, as compared with 273,427 in 1889. It must be noted that deaths from these causes have been collected this year for the first time under the designation "dysentery and diarrhœa," instead of "bowel complaints," as heretofore. It is possible that the diminished number recorded may be in part the result of this change of designation, but more probably it represents a fact, and affords an indication that the year would have been a comparatively healthy one had it not been for the epidemic of influenza. The fall in numbers was, in fact, particularly marked in Assam, in which province the new designation was not introduced until 1891. There is no doubt, however, that registration under this head is very imperfect in all the provinces. As an instance of this, the following remarks of the Sanitary Commissioner of the North-Western Provinces may be quoted:—"No death from dysentery or diarrhœa was recorded in " 11 towns, with populations of over 10,000; and in Jaunpur with a population of " 42,845, and Mainpuri, with a population of 22,736, only one death in each from " such causes was reported. In 18 other towns the recorded deaths from dysentery " and diarrhœa did not exceed 10 respectively, although the population of each " exceeded 10,000."

Injuries.

The deaths from injuries have decreased from 91,473 in 1889 to 87,264 in 1890. There has been little change in the death-rate under this heading, except in the insignificant province of Coorg. The decrease is shared by every province except Lower Burma.

All other causes.

There remains a total of 1,086,586 deaths recorded under other causes, or 1,394 more than in the previous year.

Vaccination.

The total number of successful operations performed by the Vaccination Department in India during the year 1890–91 was 5,812,829, compared with 5,519,576 in the previous year. The ratio of the successful operations per 1,000 of population was less in 1890–91 than in 1889–90 in the Punjab, Lower Burma, Bombay, and slightly in Bengal, but is greater in all provinces, except Coorg, than the mean ratio for the previous five years. The average number of operations performed by each vaccinator shows some falling off in Bengal, Punjab, Bombay, and Coorg; and the average cost per successful case was greater in Bengal, Lower Burma, Bombay, and Coorg. In addition to the above 161,769 successful vaccinations were performed by the dispensary establishment, compared with 155,491 in 1889–90.

In Bengal 2,384 vaccinators were employed, or 106 more than in the previous year, and the total number of operations increased from 1,703,288 in 1889–90 to 1,746,061 in 1890–91, the average number of operations per vaccinator falling from 748 to 732. The falling off took place in the Eastern Bengal, Metropolitan and Ranchee circles, but especially in the first-named circle, and the diminished outturn in this circle is due to the very small number of operations performed at Chittagong. Of the primary operations 99·45 per cent. were said to have been successful, but there is no evidence of this suspiciously high figure having been checked by the inspecting officers. In re-vaccinations the success claimed in the province as a whole equals 39·49 per cent. against 32·68 in 1889–90, but the Orissa and Eastern Bengal districts recorded the high percentage of success of 83·33 and 94·11 in secondary operations, figures which are open to suspicion. The death-rate from small-pox during the year 1890–91 was 0·21 per 1,000 of population, compared with 0·16 in 1889–90, and the Local Government remarks that the mortuary and vaccination statistics, in spite of admitted imperfections, disclose, on the whole, a distinct tendency towards correspondence between increased protection by vaccination and reduced death-rate from small-pox. The average cost of each successful case was 1 anna 7 pie, against 1 anna 6 pie in 1889–90. The above does not include the work done by 254 municipal and dispensary vaccinators, who performed in all 78,403 successful primary operations and 1,689 successful re-vaccinations. The Animal Vaccination Depôt in Calcutta is again

reported on unfavourably, but is about to be re-organised, while a new depôt is to be started at Darjeeling.

In the province of Assam as a whole the steady progress of vaccination noticed during the last four years has been maintained, the number of operations in 1890–91 amounting to 163,281, or 28·46 per cent. more than in the previous year. There was also an increase of 17,875 in the number of cases inspected by superior authority, and success was found to have been attained in 89·49 per cent. of the cases thus verified, or a trifle below that recorded in 1889–90, viz., 92·59. The total number of vaccinators employed was 194, or nine more than in the previous year, which accounts, to a great extent, for the increase of Rs. 2,071 in the total cost of the department. The average cost of each successful vaccination was, however, less, viz., 1 anna 9 pie, compared with 2 annas $1\frac{3}{4}$ pie in 1889–90. Vaccination work in compulsory areas also shows a steady increase as a whole, the number of operations performed during the past three years having been 1,406, 1,734, and 1,891, respectively, but in certain places is very unsatisfactory, notably in Gauhati and Sylhet. This is especially to be regretted in Sylhet, where the practice of inoculation is still very much in vogue. Here again must be added 10,174 successful primary operations performed by the tea garden agencies, besides 9,010 primary, and 48 secondary, successful operations by the dispensary officers. An Animal Vaccination Depôt was started at Shillong on the 13th of January 1890, and lymph taken from inoculated calves was subsequently distributed to all the civil stations of the province. The trials made with this lymph were, at first, so successful that Shillong lymph was preferred to English or Darjeeling lymph. In March 1891 the failures with the lymph became more numerous, owing, partly to the prevalence of respiratory disease amongst the calves, and partly to the use of lanoline, in place of glycerine, for the preservation of the lymph. Lymph so preserved proved a failure in almost every instance, but even the glycerine lymph was not so successful after February as before.

In the North-Western Provinces and Oudh, 51 additional vaccinators were entertained, and the total number of operations performed rose to 989,169 against 800,757 in 1889–90 and 764,190 in 1888–89. This increase was general throughout almost the whole province. Of the above, 948,626 were primary cases, with success in 92·96 per cent., and 40,543 were re-vaccinations, with success in 54·21 per cent. The use of animal lymph is extending, and the provisions of the Vaccination Act have been enforced in 42 municipalities.

In the Punjab 295 vaccinators were employed, or one more than in 1889-90, but the total number of operations fell from 924,814 in that year to 840,885 during 1890–91. If, however, the figures for the Kangra district (where special and exceptional circumstances operated during 1888–89 and 1889–90 to largely increase the number of vaccinations) be eliminated from the calculation, it will be found that there was a net increase of 79,349 operations during the year. The average number of operations performed by each vaccinator of the special and district staffs was 2,850 against 3,146 in 1889–90. The falling-off is again entirely due to the reduced outturn in the Kangra district. In this respect the provincial average is exceptionally high, and further proof of its having been checked by responsible authority is necessary before it can be entirely accepted. Of the total number of operations, 588,416 were primary, with success in 94·95 per cent.; and 252,469 secondary, with success in 55·95 per cent. There is a decrease of 38,869 in the primary operations performed by the district staff, compared with the previous year. The falling off was mainly in the districts of Sialkot, Gujrat, Gujranwala, and Gurdaspur, and is attributed by the Sanitary Commissioner to the great mortality amongst infants during the autumn months in those districts. The special, cantonment, and dispensary staffs performed, respectively, 10,751, 560, and 557 fewer primary operations than in 1889–90. Omitting the Kangra figures there was an increase in the number of re-vaccinations performed by all classes of vaccinators except the dispensary staff, but in some cases it appears the operation was performed quite unnecessarily, children who had only been re-vaccinated one or two years previously being again re-vaccinated. Of 3,597 primary vaccinations inspected by the Sanitary Commissioner, 93 per cent. were found to be successful; and of 3,970 inspected by the Deputy Sanitary Commissioner, 94 per cent.; so that the success claimed by the vaccinators would appear to be close to the truth. In addition to the above, 2,503 successful primary and 143 successful secondary vaccinations were performed by the dispensary establishments. Vaccination work in the larger Native states made good progress on the whole. The total cost of the department was Rs. 71,043 against Rs. 75,671 in 1889–90; and the average cost of each successful was the same in both years, viz., Rs. 0-1-7. Vaccination with animal, mainly buffalo,

lymph was carried out throughout the province generally, 335,559 more operations being performed with this lymph than in 1889–90, which shows that the popularity of the new method is extending. Experiments with animal lymph preserved in lanolin were conducted at Amritsar and Peshawur with fair success, considering the inexperience of the operators, but the Deputy Sanitary Commissioner in his report deprecates the general introduction of this lymph, in view of the already existing prejudices against animal lymph of all kinds, and because of the expense involved. He prefers the system of preserving lymph in tubes, and says that there are few, if any, stations in the province to which fresh animal lymph cannot be sent in this way without any admixture, and with a fair certainty of success.

In the Central Provinces the average number of vaccinators employed was 243 against 237 in the preceding year, but the number of operations increased to 441,989, or 7,054 more than in 1888–89, and 45,405 more than in 1889–90, after deducting for the purpose of the latter comparison the Patna figures, which were not included in 1889–90. The average number of vaccinations per operator was 1,805, compared with 1,659 in 1889–90. The total number of primary operations (excluding the figures for the Patna State) was 389,210, with success in 96·33 per cent., against 352,132, with success in 96·26 per cent. in the previous year. In five out of the 18 districts there was some falling off in the number of operations. The number of re-vaccinations increased by 2,319, but the success claimed was only 77·62, compared with 82·0 in 1889–90; the operation was probably performed needlessly in some districts. As many as 338,787 cases, or 76·65 per cent. of the whole were inspected by superior officers, with the result that 91·12 per cent. of them were found to have been successful, so that the vaccinators' returns on this point must be considered as fairly trustworthy. The total cost of the department was Rs. 49,841 against Rs. 49,752 in 1889–90; and the average cost per successful case, Rs. 0-1-10¾ against Rs. 0-2-1¼. Hospital assistants attached to dispensaries vaccinated 15,689 persons, or 997 more than in 1889–90. Of these operations 13,808 were primary, with success in 93·82 per cent. and 1,881 re-vaccinations, with success in 68·53 per cent. A few experiments were made with animal lymph imported from Berar, and the success was sufficient to justify a proposal to start an Animal Lymph Depôt at Pachmarhi.

In Berar there was a great increase in vaccination work during the year under review. In all districts a larger number of operations were performed than in the previous year, and the total for the province rose to 103,796 against 93,851 in 1889–90, and 96,100 in 1888–89. There was a slight falling off in the percentage of success in primary cases, the ratio being 95·1 against 95·7, and this is ascribed to the use of calf lymph, with which all the vaccinators are not yet perfectly proficient, but the lower ratio of success seems quite sufficiently satisfactory. In the dispensaries 10,366 vaccinations were performed against 8,346 in 1889–90, and 9,144 in 1888–89. In these cases success was claimed in 92·6 per cent. of primary, and in 39 per cent. of secondary operations. Bovine lymph has been used throughout the province since October 1890; and experiments made in preserving it with lanolin proved successful.

In Lower Burma five additional vaccinators were employed during the year, and the total number of operations performed by the special staff rose from 120,552 in 1889–90 to 140,321 in 1890–91. The average number performed by each vaccinator also increased from 2,009 to 2,159. The percentage of success claimed was 85·38 per cent. in primary, and 61·03 per cent. in secondary operations. In some of the individual districts the work was not so satisfactory, and shows a falling off compared with the previous year. In Upper Burma 28 vaccinators were employed against 26 in the preceding year, and the total number of vaccinations increased from 29,707 to 37,956, the success claimed being at the rate of 83·34 per cent. in primary, and 68·98 in secondary cases. The percentage of success in secondary operations is remarkable in both divisions of the province, and points either to bad work or incorrect reporting, in the case of previous primary operations. In Gangaw, while of primary operations only 88·4 per cent. were successful, the percentage of success in re-vaccinations is reported to have reached the full 100. The dispensary staff performed on the whole 4,956 operations, or 1,422 more than in the previous year, but the percentage of success attained was somewhat smaller, being 77·74 in primary, and 46·13 in secondary operations, against 81·66 and 61·70 respectively in 1889–90.

In the Bombay Presidency, notwithstanding an addition of three inspectors and 12 vaccinators to the working staff of the department, the number of primary vaccinations fell from 892,963 in 1898–90 to 878,665 in 1890–91, and re-vaccinations from 54,599

to 43,611. Excluding troops and dispensaries, the success in primary cases was at the rate of 95·17 per cent., and in re-vaccinations 61·33 per cent., against 94·95 per cent. and 61·64 per cent., respectively, in 1889–90. In dispensaries the percentages of success were 87·21 in primary, and 58·60 in re-vaccinations, against 87·61 and 59·21 in the preceding year. Animal lymph was in use in many parts of the Presidency, including Baroda, and there was no opposition shown to its introduction except in Karachi.

In the Madras Presidency 811 vaccinators were employed during the year, or 18 more than in the previous year, and the operations increased from 847,899 to 917,877. Only six districts showed less work than in 1889–90. The average number of operations per vaccinator increased from 1,069 in 1889–90 to 1,120, but in this respect there is still room for improvement, judging from the outturn per man in other provinces, and from the fact that in 12 of the 21 districts in Madras the average is much higher. Of the total number of operations, 867,231 were primary, with success in 94·5 per cent., and 50,646 secondary, with success in 80·9 per cent. The ratio in re-vaccinations is unusually high, and, if correct, which is doubtful, would seem to imply that the success claimed in primary cases has been rather too favourable. The percentage of successful cases amongst the total of cases inspected has not been mentioned this year, so that it is not possible to appraise the degree of its accuracy in the statements made by the vaccinators. On the 15th of November 1890, Dr. W. G. King was put on special duty to experiment with a new system of preserving lymph in lanolin, proposed by himself. The method was introduced into 12 districts, but was still on its trial at the end of the year. In the Kurnool district vaccination was carried on solely with animal lymph, the vaccinators travelling from village to village with inoculated calves, and operating from calf to arm. Excluding the unknown cases, the percentage of success was 96·3. It was found that an experienced vaccinator could perform in this way only 250 operations a month, and not 500, as had been anticipated.

In Coorg the special vaccination staff performed 7,652 operations, an average of 765 per man, as compared with a total of 8,747 operations, and an average of 875 per man in 1889–90. The dispensary officials performed 585 operations, against 215 in the previous year. Small-pox was more prevalent during the year, and altogether vaccination is not satisfactorily carried on in this province.

Sanitary Works—Military.

The total expenditure incurred in 1890–91 on military works, executed for the health and comfort of troops in India, amounted to Rs. 91,02,988. This exceeded the amount expended on similar works in 1889–90 by no less than Rs. 30,28,786. But detailed information regarding the different kinds of works is not yet available.

Civil Sanitary Works.

In Bengal during 1890 the municipalities are said to have spent about 42 per cent. of their total income (Rs. 31,38,641) on sanitary works, against 43 per cent. in the preceding year. The decrease was chiefly under vaccination, which has been specially noticed by the Lieutenant-Governor in his review. The works carried out consisted chiefly in improving sources of water-supply or drainage, constructing urinals, latrines, roads, slaughter-houses, culverts, &c., &c. Of these the most important were the completion of the Rungpore Canal for drainage and water-supply at a cost of Rs. 60,000, and the extension of the waterworks at Dacca at an outlay of Rs. 72,409. At Bhagalpur works were in progress for the further extension of water-pipes at an estimated cost of Rs. 11,000. At Faridpur a tank was being excavated at a cost of Rs. 6,594. A scheme for the discharge of sewage from Fort William into the Calcutta sewers was under the consideration of the Government of India in the Military Department. Besides these, Rs. 2,65,785 were spent by private individuals in different parts of the province on excavation of tanks and improvement of other sources of water-supply, &c. The most important of these were the construction of a large tank with masonry steps by the Rani of Puttia in Rajshahye at a cost of Rs. 30,000; the donation of Rs. 1,12,500 by Raja Surja Kant of Muktagacha in Mymensingh towards waterworks for the head-quarters station; and the contribution of Rs. 11,466 by the Maharaja of Durbhunga for clearing the Sivagunga and improving the drainage of Deoghur.

The Sanitary Commissioner states that for want of necessary funds no progress could be made in regard to village sanitation; but the Local Government points out that Rs. 43,762 was spent in 1890 by the District and Local Boards on sinking wells, excavating and clearing tanks, and improving drainage channels.

Although the Sanitary Board of the province was established in December 1889, it did not come into practical working order till August 1890, when the Sanitary Engineer joined his appointment. Since then several subjects have engaged the Board's attention, such as the drainage and water-supply of Howrah, the drainage of certain municipalities on the left bank of the Hooghly, the drainage of Serampore, the drainage of Pooree, &c., and works in connexion with some of them were about to be taken in hand.

The Local Government has resolved that for the present the Board should confine itself to the limits of the municipal areas, in preparing schemes for water-supply and drainage, and the data brought together in the tabular statements at pages 39 to 50 of the Sanitary Commissioner's Report show that there is ample material to keep the Board fully employed for some time to come. Village union committees, as an agency for the sanitary improvement of rural areas, have not as yet been called into existence.

The chief sanitary works of importance inaugurated during the year in the North-Western Provinces were the Agra Waterworks, opened on 3rd December at a cost of Rs. 4,22,093. At Allahabad the scheme for supplying filtered Jumna water to the town and cantonments was nearly completed. At Benares the waterworks project was also well advanced.

Rs. 19,201-4 were expended by the Hardwar Union for sanitary purposes, but this includes a sum of Rs. 6,352 for widening and improving the embankment leading from Harkipahri to Gaughat; and a sum of Rs. 2,085 for improving the road from Dehra Dun to Hardwar. At Lucknow Rs. 90,569 were spent for sanitary purposes, of which Rs. 17,520 were devoted to original works (latrines, drainage, and wells), Rs. 2,252 to repairs, and Rs. 70,797 to conservancy and vaccination. At Cawnpore Rs. 44,711-9-3 were expended on conservancy, and Rs. 20,615-15-10 on original sanitary works—drainage and roads. At Jhansi the drainage scheme was completed, and some minor improvements effected.

The Sanitary Board constituted under the Local Goverment's orders of the 9th February 1889 met frequently at Naini Tal during the hot weather and rains of 1890, and can show a fair record of useful work. The district reports of specially insalubrious tracts which had been called for were examined and submitted to Government with a memorandum on each revenue division, in which the localities requiring drainage were specified, and the adequacy, or otherwise, of the remedial measures already taken or in progress stated. Recommendations submitted for the improvement of the registration of mortuary and vital statistics in rural areas and in municipalities were accepted in the main by the Local Government. The Board also submitted a scheme for observing the volume of sewerage discharged into the Ganges, Jumna, and Gumti by the largest towns on their banks, and for securing a proper analysis of the water of these rivers.

The reports of the special committees appointed by Government to examine the sanitary state of the Naini Tal and Mussoorie municipalities were considered by the Board at its last meeting in December 1890, and their recommendations have been acted upon. A Village Sanitation Bill was also discussed, and a Draft Bill, which is designed gradually to secure for all the larger villages a supply of pure drinking-water, has since been drawn up by the Local Government.

In the Punjab 26·69 per cent. of the income of the municipalities was spent on sanitation during 1890 against 21·5 per cent. in 1889. The total expenditure amounted to Rs. 12,57,560. Some of the important sanitary works executed or in hand were as follows:—Schemes for the drainage and water-supply of Bhiwani were under consideration. The drainage scheme of Palwal was also being considered. At Delhi a conservancy tramway has been completed at a cost of Rs. 44,359; much progress has been made in the construction of the waterworks; and a complete scheme for the drainage of the city was in hand. A project for the drainage of the Umballa city was under consideration. At Kalka the water-supply was improved at a cost of Rs. 11,434. The extra-mural drainage of the city of Jullunder was in hand, and the drainage of the town of Bungah was completed. Fair progress was made in the drainage works of Ludhiana. The drainage schemes of Ferozepore and Mooltan were under consideration. A project for the drainage of Mozung, near Lahore, has been sanctioned. At

Amritsar the filling up of the city ditch was completed; Rs. 20,544 were expended on drainage and sewerage; and a project for providing pure drinking water to the city was being prepared. At Gujranwala an extra-mural drainage project was in hand, and an estimate for intra-mural drainage has been submitted to Government. Schemes for the drainage of the Rawal Pindi city, and the water-supply of Murree were under the consideration of the Government. The waterworks of Abbottabad and Peshawar were in progress. A scheme for the water-supply of the town and cantonment of Kohat was under the consideration of the Government.

A Sanitary Board for the province was constituted during the latter half of the year. Its duties are mainly to afford advice and assistance, and to make recommendations to the municipalities in providing for their sanitary wants. Very little was achieved by the Board in this direction during the few months of its existence in the past year, but the information collected in Appendix A. of the report supplies enough material for the exercise of their functions in the current year. Under the new Punjab Municipal Act (XX. of 1891), ample powers have been conferred on the Local Government to enable it to provide for the sanitation of villages.

In the Central Provinces minor sanitary improvements were carried out in almost all the towns, but in regard to important works the Sanitary Commissioner states that "with the exception of the work in connexion with the water-supply of the towns of "Nagpur and Jubbulpore no large sanitary projects have been carried out during the "year." These works are after all only extensions of the already existing waterworks, and credit for them has already been taken to a certain extent in the previous year. The amounts spent on waterworks in 1890 at these two towns were respectively Rs. 9,283 and Rs. 5,048. Schemes for the water-supply of Burhanpur, Khandwa, and Raipur were about to be taken in hand. In all Rs. 1,87,698 was spent on sanitation by the towns in the head-quarters of districts.

Since its constitution the Provincial Sanitary Board has had under its consideration the water-supply schemes and sanitary surveys of several municipalities. Of the former, the preparation of some of them has been taken up by the Department of Public Works. A survey of the Nagpur and Jubbulpore municipalities was being made, with a view to introducing drainage schemes for those towns.

With regard to rural sanitation, rules have been issued under the Village Sanitation Act, and the rules made under the Land Revenue Act on the subject of the cleanliness of villages have also been revised, but questions regarding the raising of necessary funds for carrying out and enforcing those rules were engaging the attention of the Chief Commissioner, and until some definite course has been decided on, no results can be expected. In the districts, on the whole, 180 old wells were repaired, and 222 new ones were constructed during the year.

During the year under notice the municipalities in Berar spent in all Rs. 1,03,183, or 45·4 per cent. of their income on sanitary works, but of this amount nearly one-half was for conservancy. No important works were undertaken by any of the municipalities; but an elaborate scheme has been drawn up for the water-supply of Akola, and a project for the drainage of Amraoti was under consideration. In the districts outside municipal limits, Rs. 1,24,484 were allotted for sanitary improvements, and out of this sum Rs. 1,19,621 were spent during the year, the percentages of total income devoted to conservancy, drainage, and water-supply being respectively 29·1, 13·5, and 22·6. In the Public Works Department of the province there was a total expenditure of Rs. 1,50,924 on sanitary works during the year. Some of the important works executed by this Department were:—the construction of the Bhir dam at Chikhalda at a cost of Rs. 28,655; the laying of concrete drains in the town of Murtazapur at a cost of Rs. 16,399; the extension of the Amraoti City Waterworks (Rs. 32.204); and the Buldana water-supply (Rs. 34,918).

Mention is made of the District Sanitary Boards and their duties, but nothing definite is stated about anything having been actually achieved by them in the matter of sanitary reform. For the rural areas Village Sanitary Boards have been constituted, who are required to supervise the working of a code of village sanitation rules laid down by the Resident; and it is satisfactory to note that the results so far have been encouraging. The Sanitary Commissioner states that by enforcing those rules the surface cleanliness of village sites is now more general, the manure heaps which formerly occupied some spare corners in the streets or house enclosures are being gradually removed to the outskirts, boundaries are demarcated generally by posts, within which people are not allowed to answer the calls of nature, and wells are being protected where necessary.

The total income of the different municipalities, stations, unions, and towns in Assam amounted to Rs. 1,63,260, and the total expenditure on sanitary works and other improvements to Rs. 94,060 against Rs. 1,41,144 and Rs. 98,681 respectively in 1889. The amount spent on conservancy has increased from Rs. 24,748 in 1889 to Rs. 30,555 in 1890; but that on water-supply has decreased from Rs. 16,090 to Rs. 15,525. It is satisfactory to notice that strict measures are contemplated with a view to providing a proper water-supply for the town of Sylhet—a matter which has been much neglected for some years past.

Appendix B. of the report contains a *resumé* of the work done by the local Sanitary Board. A scheme of sanitation for selected villages was inaugurated in 1888, and had for its chief objects—

(*a*) the improvement of the drinking water-supply;
(*b*) the establishment and maintenance of a proper system of drainage; and
(*c*) the prohibition of the deposits of manures, &c., in places where they would be injurious to the public health.

The project, though satisfactorily begun in the Lakhimpur district, for instance, was not properly carried out either in that or other districts. A recommendation has been submitted to the Chief Commissioner for immediate steps to be taken to insist on a strict compliance with the orders issued on the subject. On the other hand, a good beginning was made in towns and municipalities. Under the supervision of the Board a sanitary survey was made of each place, and its sanitary wants were thus ascertained with a view to meeting them as funds might permit. Water-supply, drainage, and conservancy received special attention in this connexion. Since then much valuable work has been initated or completed, though very much remains to be done in these directions. The work of improving sanitation in municipal areas, which was generally attempted in 1889, has not since been so steadily carried on, want of funds being, as a rule, the excuse advanced.

In Lower Burma Rs. 69,985 were spent by the Department of Public Works on sanitary improvements and works; this does not include a further sum of Rs. 15,246 spent on hospitals. In many of the municipalities a good deal of their income was spent on conservancy arrangements, or repairing roads and wells, or constructing culverts and latrines, &c., &c. Some of the important works executed or in hand were as follows:—At Rangoon the Shone and Ault hydro-pneumatic drainage system began to be fully worked on the 28th April 1890, but in connexion with this the Chief Commissioner in his review of the Sanitary Report remarks that "It is much to be "regretted that such a costly scheme was adopted without a thorough examination of "all the collateral details and without due legal provision being made for its effective "introduction. The water-supply of the town is at present inadequate for the proper "flushing of the sewers, and house-owners cannot be compelled to connect." Reclamation of low-lying ground to the east of the town was continued at a cost of Rs. 79,109; public latrines and urinals were constructed all over the town at an outlay of Rs. 59,013, and the sewerage system was extended to the suburbs of the town at a cost of Rs. 39,050. At Bassein a conservancy tramway and trucks were constructed at a cost of Rs. 18,851; and schemes for reclamation of swampy land in the vicinity were under consideration.

A Sanitary Board has been in existence in the province from December 1888, and since then it has had under its consideration the questions of village sanitation, a scheme for water-supply in municipal towns, sewerage farming, improving the condition of the suburbs of Rangoon, &c., &c.; but for want of a Sanitary Engineer no practical progress has yet been made. A set of village sanitation rules has been framed by the Board, but they are still under the consideration of the Chief Commissioner; with regard to sewerage farming, an experiment was to have been started in connexion with Paungde Reformatory; and the Inspector-General of Jails was invited to introduce the system in 11 of the jails.

With reference to Upper Burma, the Sanitary Commissioner says, "In most of the "towns some attempt at scavengering and conservancy has been made, but with the "limited funds at their disposal it has not been possible to do a great deal." A scheme for the removal and disposal of night-soil was being tested at Mandalay, and projects for the drainage and water-supply of that town were under consideration.

Of the total estimated income (Rs. 21,17,640) of the 55 Mofussil municipalities of Madras, Rs. 7,09,092 (33·5 per cent.) were allotted to sanitation, and of the latter sum, only Rs. 4,20,513 (59·3 per cent.) were spent during the nine months ending December 1890, which, as remarked by the Local Government, is anything but creditable to the

municipal councils concerned. The accommodation afforded by public latrines was, it appears, generally insufficient in municipal areas. The Local Government is, however, fully alive to the importance of increasing their number and ensuring their thorough conservancy. Measures were also adopted for extending and perfecting the private scavengering system. Some improvement was effected in the sanitary condition of the towns of Erode, Bezvada, Cuddapah, and Tirupati. In areas under the control of Local Boards, increased attention was paid to the protection of the drinking water-supply, but general conservancy operations were very backward.

Only 55 per cent. of the allotments provided for sanitation in Local Fund areas was expended up to the 31st December 1890, but steps have been taken by the Local Government to secure better results in future. At the commencement of the year a more or less sufficient supply of good drinking water was available in only three municipal towns, viz., Cuddalore, Masulipatam, and Ootacamund. Orders have been issued for the extension and improvement of existing arrangements in the first two of these, while in Ootacamund an extension of the water-supply to the south side of the town has been sanctioned. In Cuddapah the Bugga water project was completed, but still requires improvement, and schemes for water-supply were either under preparation or sanctioned in eight other municipal towns. Drainage schemes for Kumbakonam, Ootacamund (Kandal Bazar), and Coonoor have been finally sanctioned, and similar projects for other municipalities are contemplated. An elaborate scheme for the improvement of the River Cooum at Madras was also prepared by the Sanitary Engineer and is under the consideration of the Local Government.

In Bombay a good deal of the income of the municipalities was spent on conservancy arrangements. Minor improvements were also carried out in most of the towns. Some of the important sanitary works, which were executed during the year or were in progress or under consideration, were as follows :—"A scheme for the supply of "pure water to the town of Ahmedabad was under consideration. At Dholka a drain "was constructed at a cost of Rs. 6,450 for draining the low-lying lands. At Viram-"gam a scheme of water-supply was under consideration. At Dhulia works were in "progress for bringing water to the city from a tank at a distance of about seven "miles. For securing a supply of pure water for the city of Poona, the municipality "has sanctioned the construction of filter works at a cost of Rs. 2,00,000. A drainage "scheme for Poona was also approved by the municipality. At Panvel a scheme was "under consideration for bringing water from springs about eight miles from the "town. At Sukkur city drainage works, with flushing and ventilating arrangements, "were completed." In the Sanitary Commissioner's report a list is given of the villages and towns inspected by the Deputy Sanitary Commissioners, together with detailed information regarding the present state of their water-supply, drainage, and domestic cleanliness, as well as the measures that were adopted during the year to improve them.

In Coorg there is not much to record under the head of Sanitary Works. Eight wells were constructed by the Public Works Department at a cost of Rs. 475-14-11 and five old wells were repaired for Rs. 118-11-8. The municipalities spent in all Rs. 4,786-10-8 on some petty improvements, such as the construction or repair of wells, drains, &c.

The Sanitary Board of the province held three meetings in 1890. In accordance with its recommendation steps were taken for improving the sources of water-supply in many stations; a special inspector was appointed by the Mercara municipality to supervise the conservancy arrangements of the town and carry out any sanitary works that may be undertaken; and a proposal to extend the Central Provinces Village Sanitation Act to Coorg was engaging the attention of the Chief Commissioner.

General Remarks.

Cholera at the Haj.

After an interval of six years cholera again broke out at the Haj of 1890. On the 28th of July, the third day of the Haj, and the second day that the pilgrims had been in the town of Muna, cholera appeared amongst some of the poorer class of pilgrims, and 21 deaths from it occurred on that day. The next day, early in the morning, the sanitary authorities made the pilgrims disperse and return to Mecca, but 72 of them died on the road between Muna and Mecca on that day, and there were 84 deaths from cholera in Mecca itself. The disease continued to prevail at Mecca until the 21st of August, the total number of deaths from it being 2,574; the largest number of deaths in any one day was 485, on the 1st of August. At Jedda the disease appeared on the 1st of August, and continued to prevail daily until the 2nd of September, but the total

number of deaths recorded was only 1,317. There were also 23 deaths from cholera at Yembo between the 28th of August and the 1st of September. The total number of pilgrims, and the ordinary population of the towns in question, are not known, but the mortality from cholera appears to have been small, considering that as many as 43,496 pilgrims arrived by sea alone.

Quarantine at Camaran.

During the pilgrim season 29 ships and one small vessel called at Camaran to undergo quarantine. The total number of pilgrims carried by these vessels was 20,184, of whom 9,904 came from Bombay or Calcutta. All the ships except one were free from disease, and received their pratique after an interval of five to ten days. The one exception was the s.s. "Deccan," which left Bombay on a third voyage with pilgrims on the 17th of June. There were 1,225 pilgrims on board, and they had to be battened down between decks, to prevent their being swept away by the heavy seas the ship encountered, and suffered very much in consequence from overcrowding. Cholera broke out on the 25th of June, and before the ship reached Aden there had been ten cases, of which six were among the pilgrims, and four among the crew. After Aden there were two more cases. Of the 12 persons attacked eight died at sea and four were landed at Camaran. There were also many cases of diarrhœa amongst the pilgrims at the time of their landing, which took place on the 2nd of July. On the 6th cholera again broke out among the pilgrims on shore, and on the 9th among the crew of the ship. Cases of cholera continued to occur until the 28th of August, and on the 29th the pilgrims were re-embarked, and the ship returned to Bombay, so that the pilgrims did not reach Jedda or get near the Haj. During their stay at Camaran, 38 of the "Deccan's" passengers died of cholera, and 50 from other causes. They complain of the insanitary state of the camp at Camaran, the insufficiency of the supplies generally, and of the drinking water in particular, of the exorbitant charges made by the official contractors and the neglect of the sick.

Outbreak on board the s.s. "Malacca."

At the close of the pilgrim season, in August 1890, there was an outbreak of cholera on board the s.s. "Malacca" while on her way from Jedda to Constantinople with returning pilgrims. This steamer had previously in May brought pilgrims from Bombay to Jedda, but on that occasion there had been no unusual or fatal sickness on board, and the subsequent outbreak of cholera was clearly not connected with anything that had occurred on the previous voyage.

Scientific memoirs.

In Part VII. of the Scientific Memoirs, published in connexion with this report, Surgeon-Captain G. M. Giles records in a series of notes some collateral investigations connected with his inquiry into the nature of Kala-Azar, which resolved itself into an investigation of the life-history of the *Dochmius duodenalis*.

In his report on Kala-Azar he has shown that the free, or "rhabdite," stage of the Dochmius is capable of reaching maturity, and of multiplying indefinitely as a free nematode, provided only that a sufficiency of suitable food is supplied, and in the first of the present notes he establishes a similar life-history for a closely allied equine parasite, the *Sclerostomun tetracanthum*. Here, unlike the Dochmius' rhabdites, the free worms cannot reach maturity without other food than the excremental matter in the midst of which they are born, but crawl on to forage plants, on the juices of which they feed by means of a peculiar style, with which they are provided; but once these surroundings are gained, they, too, seem capable of multiplying through any number of generations without reverting to a parasitic life. The parasitic stage of this worm in conjunction with two other closely allied species is believed by Surgeon-Captain Giles to have been the cause of a serious mortality among horses and mules at Shillong. A description of one of these allies forms the subject of a second note. It is a formidable blood-sucking parasite which is now, it is believed, described for the first time. A third note deals with nodular disease of the intestines in sheep, a malady hitherto unnoticed in India, caused by a parasite of the same group as the above mentioned, and having a similar life-history. The two remaining notes contain descriptions of two new ovine parasites which appear to have none of the economic importance which attaches to the preceding.

Surgeon-Captain Charles gives an account of the finding of specimens of Guinea-worm in the sub-peritoneal tissue of the human subject, amongst which, in two instances, what are believed to be male parasites were discovered attached to the female. In thus discovering the long sought for male parasite, Dr. Charles believes he has filled up a blank in the life-history of the Guinea-worm. Reasons are brought forward explaining why the male has not heretofore been found, and for believing that the old idea of the parasite gaining entrance by the skin of the host is fallacious. Light is also thrown on other doubtful points in the life-history and morphology of this interesting parasite.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR MADRAS FOR 1890.

General Population.

Vital statistics.

The important work of registration was still carried out as in former years by means of registrars in municipal towns and by curnams in villages. In both towns and villages, on the whole, there has been an improvement in this work, and in places where it is not carried on in a satisfactory manner the cause is chiefly due to the men who are entrusted with the work looking upon the duties of registration as mechanical, and apparently purposeless, and they can only be made to realise their importance by the interest taken in the subject by district officials when on tour, and by occasional inspections of the books. The records of births and deaths during 1890 does not extend to the whole population as ascertained at the census of 1881, viz., 30,835,771; as there are some tracts of zemindary estates, &c., for which no birth and death returns are received. The total population for which returns were furnished in 1890 was 28,522,313, being 2,313,458 short of the total population. In 1889 the total population for which returns were furnished was 28,050,087, being 472,226 less than that for 1890.

In the Madras Presidency, during the year 1890, there were 893,645 births registered against 867,523 in 1889, showing an increase of 26,122 for the year under report. The ratio per 1,000 of population was 31·3, the highest on record in this Presidency, and is, it is believed, nearer to the true ratio than any hitherto obtained. The following table shows the number of births registered in each of the past 20 years, and it is satisfactory to notice the improvement that has taken place:—

Years.	Population for which returns were received.	Births.	Birth-ratio per 1,000.	Deaths.	Death-ratio per 1,000.
1871	24,555,046	506,707	20·6	444,371	18·0
1872	30,147,779	543,325	18·02	501,482	16·6
1873	30,287,842	527,363	17·4	506,894	16·4
1874	30,360,221	569,631	18·7	516,848	17·0
1875	30,278,903	625,953	20·6	641,260	21·1
1876	29,157,056	619,748	21·2	680,384	23·3
1877	29,209,542	467,543	16·01	1,556,312	53·2
1878	29,127,205	341,388	11·7	810,921	27·8
1879	28,991,267	467,938	16·1	549,390	18·9
1880	28,778,097	641,769	22·3	454,101	15·7
1881	28,676,375	716,672	24·9	465,682	16·2
1882	28,887,111	743,777	25·7	470,700	16·2
1883	28,503,100	774,754	27·2	541,930	19·0
1884	28,151,952	810,102	28·8	650,335	23·1
1885	28,118,178	807,105	28·7	615,449	21·8
1886	28,043,538	837,077	29·8	553,927	19·7
1887	27,907,840	849,551	30·4	604,775	21·6
1888	27,852,474	833,345	29·9	597,015	21·4
1889	28,050,087	867,523	30·9	661,178	23·5
1890	28,522,313	893,645	31·3	650,394	22·8

As already mentioned, the average birth-rate for the Presidency was 31·3 per 1,000 inhabitants, but the rates in the several districts varied, ranging from 18·2 in Ganjam to 43·6 in Madras. The low birth-rate in Ganjam for 1890 is due partly to the effects of the distress which prevailed in 1889, and partly to defective registration. In all the districts, with the exception of Coimbatore and Ganjam, the birth-rates were higher than the average for the previous 10 years. In eight districts (Anantapur-Bellary, Cuddapah, Godávari, Kistna, Kurnool, Madura, Malabar, and Nellore) the birth-rates were lower than in 1889, and in the remaining 13 districts they were higher. The increase was most marked in the districts of South Arcot, Madras, and Nílgiris, and the decrease in Cuddapah, Bellary-Anantapur and Kistna. The highest birth-rates were registered in Madras (43·6), Kurnool, (41·1), and Chingleput (40·3), and the

lowest in Ganjam (18·2), Godávari (22·5), and excluding the Nílgiris, Vizagapatam (23·6). These three districts have for some years always returned the lowest birth-rates. It is, however, satisfactory to notice the progressive improvement that has taken place in Vizagapatam, but the birth-rate for Godávari shows a decrease, which is far from satisfactory.

In three districts (Chingleput, Kurnool, and Madras) the birth-rate was above 40 per 1,000 (the assumed standard); in 11 it was between 30 and 40, and in the remaining seven districts it was under 30 per 1,000.

Of the 893,645 births registered during 1890, there were 455,962 males and 437,683 females, so that the birth of boys were in the ratio of 104·2 to every 100 girls born, and therefore in exactly the same proportion as in 1889.

In every district, with the exception of the Nílgiris, the births were more numerous than the deaths, the excess per 1,000 of population ranging from 16·3 in Chingleput to 0·9 in Madras. The excess of deaths over births on the Nílgiris was 1·2 per 1,000, and is due to the custom among many natives living on the hills of sending their wives to the plains to be confined. The increase of the population was 8·5 per 1,000 in 1890 against 7·4 in 1889.

The rural birth-rate for the Presidency was, as usual, higher than the urban, the ratios per 1,000 of population being 31·2 and 30·0 respectively, and; as mentioned in last report, this result may in some measure be due to births obtaining more notoriety in villages than in towns of considerable size. In 11 districts (Bellary-Anatapur, Chingleput, Cuddapah, Kurnool, North Arcot, Salem, South Arcot, South Canara, Tanjore, Tinnevelly, and Trichinopoly) the birth-rates were higher in rural than in urban populations, the difference being very marked in Cuddapah, Chingleput, and Kurnool.

On the whole, there has been an improvement in the registration of births in municipalities during 1890 when compared with 1889. In nine towns (Dindigul, Bezváda, Anantapur, Karúr, Palni, Coimbatore, Wálajápet, Conjeeveram, and Periyakulam) the birth-rate was above 40 per 1,000. In 18 towns in 1890, against 27 in 1889, the birth-rates were below 30 per 1,000, and such low birth-rates show the necessity there is of greater attention being paid to birth registration in these municipalities. In sixteen towns (Bezváda, Palni, Coonoor, Calicut, Vániyambádi, Tuticorin, Rajahmundry, Ootacamund, Kumbakónam, Tirupati, Tinnevelly, Chidambaram, Negapatam, Trichinopoly, Cocanada and Cuddapah) the birth-rate was lower than the death-rate.

In a population of 28,522,313, for which returns were received, the deaths numbered 650,394, being at the rate of 22·8 per 1,000 of population, against 23·5 per 1,000 in 1889 and 21·6 the average for the five years 1885–1889. The decrease in the death-rate was mainly due to cholera not having been so prevalent in 1890 as it was in 1889.

The following abstract shows the chief causes of death during 1890, compared with the result of 20 previous years:—

Years.	Total Deaths.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	Other Causes.
1870	451,020	55,867	11,252	151,027	—	12,325	220,549
1871	444,371	17,656	20,823	192,469	38,928	15,323	159,172
1872	501,482	13,247	39,074	214,148	39,387	15,150	180,476
1873	506,894	840	51,784	222,843	36,392	14,251	180,784
1874	516,848	313	48,343	226,220	37,993	13,065	190,914
1875	641,260	94,546	24,775	252,042	37,484	12,421	219,992
1876	680,384	148,193	23,469	230,092	38,176	11,175	229,279
1877	1,556,312	357,430	88,321	469,241	133,366	16,460	491,494
1878	810,921	47,167	56,360	374,443	48,083	15,007	269,861
1879	549,390	13,296	17,840	285,477	23,218	12,619	196,940
1880	454,101	613	14,529	209,940	19,622	10,845	198,552
1881	465,682	9,446	15,776	203,542	18,961	11,527	206,430
1882	470,700	23,604	20,159	188,561	19,958	11,611	206,807
1883	541,930	36,284	37,975	203,786	22,098	11,509	230,278
1884	650,335	75,476	61,247	215,977	28,775	11,502	257,358
1885	615,449	58,109	34,726	218,786	31,209	11,659	260,960
1886	553,927	12,417	17,129	221,679	27,379	13,103	262,220
1887	604,775	28,359	21,472	240,860	26,679	11,328	276,077
1888	597,015	58,677	21,858	204,561	27,721	11,401	272,797
1889	661,178	76,020	29,138	230,172	29,122	11,506	285,220
1890	650,394	35,288	28,092	262,855	26,608	10,402	287,149

It is satisfactory to note that there was a very marked decrease as compared with the previous year in the number of deaths from cholera. On the other hand, the mortality from fevers shows an increase.

The mortality amongst infants under one year of age was, as usual, very high. Out of a total death roll of 650,394 no less than 144,292, or more than one-fifth of the deaths were amongst children under one year of age, and this represents a death ratio of 160·5 per 1,000 of population. The deaths under five years of age formed 36·9 per cent. of the total deaths, and this high rate of mortality is a sure indication of bad sanitation. The period when fewest deaths occurred was, as in 1889, in the age of 10 and under 15, the death-rate being 5·8 per 1,000 of population. For the period about 60 and upwards the mortality was at the rate of 57·1 per 1,000.

With regard to the influence of sex on mortality, it appears that from infancy up to 10 years the death-rate was greater among males than females, but that between the age of 15 and 30, a period burdened with maternal cares, the death-rate among males was less. From 30 years and upwards females had again the advantage as regards expectation of life.

According to classes, the death-rate amongst the Hindus was 23·0 per 1,000, 21·3 amongst Muhammadans, 18·9 amongst Native Christians, and 15·1 amongst other classes. The highest rates of Hindu and Muhammadan mortality appear against Madras, but, proportionally, most Native Christians died on the Nílgiris. In 11 districts (Chingleput, Godávari, Kistna, Kurnool, Madura, Nellore, Níligris, North Arcot, Salem, Tanjore, and Vizagapatam) no deaths were recorded among other classes.

The minimum death period in the Madras Presidency is usually the hottest and driest period of the year. The mortality subsides with the increasing temperature of March and April, rises again in July, and reachest its highest in the cold months of December and January. The year 1890 was, however, an exceptional one, the highest death-rate occurring in May, and was due to an unusual increase of deaths under "fevers" in that month.

As has been the case for some years, the mortality in Madras was higher than in any other district in the Presidency, being at the rate of 42·7 per 1,000 of population. The cause of this great mortality was due to the high death-rates in Madras from bowel complaints and "all other causes," when compared with the ratios of other districts. The death ratios in the several districts varied greatly, and, excluding Madras, ranged from 13·4 per 1,000 in Ganjam to 29·7 in Kurnool. The death-rates exceeded the ratios for the previous 10 years in all the districts, with the exception of Chingleput, Ganjam, Godávari, and Malabar, in which they were lower, and in Tanjore they were equal. In 14 districts (Coimbatore, Cuddapah, Madras, Madura, Malabar, Nellore, Nílgiris, North Arcot, Salem, South Arcot, South Canara, Tanjore, Tinnevelly, and Trichinopoly) the death-rates per 1,000 of population were higher in 1890 than in 1889, but in the remaining seven they were lower. The largest increase in mortality took place in the Nílgiris, the death-rate in 1889 being 16·0 per 1,000 of population, while in 1890 it was 24·4 per 1,000 of population, and was chiefly due to an increase of deaths under fevers and "all other causes." The greatest decrease in the death-rate took place in Ganjam, where the deaths under all the principal causes (with the exception of injuries) were much less than those in the preceding year, especially those from cholera.

The death-rates among the urban and rural population were, respectively, 22·1 and 22·2 against 28·0 and 22·9 in 1889. In all the districts, with the exception of Anantapur-Bellary, Kurnool, South Arcot, and South Canara, the urban death-rate was higher than the rural. The death-rates from cholera, small-pox, bowel complaints, and "all other causes" were higher amongst the town than the rural population, while as regards fevers the reverse was the case. Judging from the death-rates amongst the rural population, the most unhealthy districts, excluding Madras, were apparently Kurnool, South Arcot, and South Canara.

The average death-rate of the 55 municipal towns was 29·1 per 1,000, or 6·7 higher than the district rate. In 25 municipalities the death-rate ranged from 30 to 54·4 per 1,000, in 25 from 20 to 30, and in 5 the death-rate was below 20 per 1,000.

Chief Diseases.

During 1890, cholera caused 35,288 deaths throughout the Presidency, or 40,732 less than in 1889, and 2,612 fewer than the mean of the previous 10 years. Cholera.

The following table shows the ratios of cholera deaths for the past 20 years :—

Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.
1871	0·7	1878	1·6	1885	2·06
1872	0·4	1879	0·4	1886	0·4
1873	0·02	1880	0·02	1887	1·01
1874	0·01	1881	0·3	1888	2·1
1875	3·1	1882	0·8	1889	2·7
1876	5·08	1883	1·2	1890	1·2
1877	12·2	1884	2·7		

In no month of the year was cholera absent from the Madras Presidency. The largest number of deaths was registered in January, and in this Presidency cholera attains its maximum degree of intensity during the cold weather months. The fewest number of deaths took place in October. Including the sporadic cases that occurred, cholera deaths were reported from 19 out of the 22 districts of the Presidency.

In January, deaths from cholera were reported from 16 districts, and caused 7,448 deaths. In February, the disease was present in 13 districts, causing 5,169 deaths. In March, April, and May, it subsided, as the deaths were 2,441, 1,988, and 1,755 respectively. In June, the disease increased, and caused 2,868 deaths. In July, it assumed a still greater intensity, and 3,344 deaths were reported, but again in August the disease decreased, and still further declined in September and October, the deaths in October being 1,062, the minimum of the year. In November and December, an increase took place, and 1,284 and 3,245 deaths were reported.

The districts in which no deaths occurred were Bellary, Godávari, and South Canara. In Vizagapatam only 3 deaths were registered, all occurring in January. In Nílgiris 7, and in Kistna 9. The districts which suffered most from cholera were those in the south of the Peninsula, viz., Tinnevelly, Madura, and Tanjore, the ratios per 1,000 of population being 3·4, 3·1, and 2·6 respectively. The districts on the east coast north of Madras were comparatively free of the disease. Thus in Ganjam 60 deaths were recorded, in Vizagapatam 3, in Godávari none, in Kistna 9, and in Nellore 39.

Out of 44,449 villages in the Presidency, 4,197 or 9·4 per cent. were affected by cholera. The highest percentage occurred in the Malabar district, where, out of its 440 villages, 188 or 42·7 per cent. were affected.

Of the 77 towns, in 46 deaths from cholera were registered, and in the remaining 31 no deaths were reported.

Of the 35,288 deaths from cholera which were reported during the year, 4,920 occurred in municipal towns. The municipal cholera death-rate was 3·4 and that of the district 1·1 per 1,000 of population.

During 1890 there were 28,092 deaths from small-pox, 14,154 males and 13,938 females, against 29,138 in 1889 and a decennial mean of 27,401. The deaths attained a ratio of 1·0 per 1,000, the same as that for last year. The mean of the five years 1885–89 was 0·9 per 1,000. Small-pox.

There were 6,286 children under 1 year of age, and 12,192 over 1 and under 12 years of age who died from small-pox, or 22·4 per cent. of the deaths occurred among infants under 1 year of age, and 43·4 per cent. took place among children over 1 and under 12 years of age, the remaining 34·2 per cent. being among persons over 12 years of age. The proneness of the disease to attack infants and young persons unprotected by vaccination is thus seen.

In all districts in 1890 deaths from small-pox were registered. The heaviest mortality was recorded in the South Arcot district, in which the high death-rate of 4·5 per 1,000 was registered. The district of North Arcot stands second on the list, with 1·9 per 1,000, and the districts of Kistna, Cuddapah, and Bellary-Anantapur follow, with rates varying from 1·2 to 1·0 per 1,000. The lowest recorded death-rate—only 0·06 per 1,000—was registered in the South Canara district. The rates were low in Madras, Malabar, and Nellore districts. In 11 districts (Bellary-Anantapur, Coimbatore, Ganjam, Godávari, Kurnool, Malabar, Nellore, Nílgiris, South Canara,

Tinnevelly, and Vizagapatam) the recorded death-rate from small-pox was lower than the average of the previous five years. In three (Madura, Salem, and Trichinopoly) it was equal, while in the remaining seven (Chingleput, Cuddapah, Kistna, Madras, North Arcot, South Arcot, and Tanjore) it was higher.

In all municipalities, with the exception of Anantapur, Parlákimedi, Kurnool, Dindigul, Periyakulam, Tellicherry, Cochin, Ongle, and Mangalore, deaths from small-pox were reported. The highest death ratios (10·2 and 9·9) took place respectively in Bezváda and Cocanada, and the lowest (0·04) in Nellore.

Fevers.

During 1890 there were 135,354 males and 127,501 females, or a total of 262,855 persons, reported to have died from fever, against 230,172 in 1889, showing an increase of 32,683 for the year under review. The mean for the previous five years was 223,212.

As usual (*vide* table on page 97), the number of deaths registered under "fevers" was, with the exception of "all other causes," very much greater than the numbers recorded under other classes of disease.

In all districts, with the exception of Ganjam and Vizagapatam, the fever death-rate was higher than that of the previous year. As a general rule, the mortality from fever is greatest in the Kurnool district; and for 1890 it again heads the list with a very high ratio of 22·9 against 19·9 in 1889, and 19·7, the mean ratio per 1,000 for the previous five years. In the following districts high death ratios occurred:—Cuddapah 17·3, Nílgiris 17·0, Vizagapatam 14·9, Salem 12·3, and Madras 11·7, the Presidency ratio being 9·2.

In all months (with the exception of August, October, and December) the deaths from fever were above the corresponding month in 1889. The maximum mortality from fever took place in May, when 35,038 deaths were reported, and the minimum in March, when 17,453 deaths were recorded. During April, May, and June many deaths were registered, and this was due to the influenza epidemic which prevailed in the Presidency during these months.

Fever was less prevalent in towns than in rural circles during the year under report, the death-rate for the districts being 8·1 per 1,000 of population, while that for municipal towns was 6·7. In 15 towns (Cuddapah, Karúr, Tirupatúr, Tirupati, Parlákimedi, Bezváda, Ádóni, Tuticorin, Conjeeveram, Srírangam, Tanjore, Kumbakónam, Máyavaram, Negapatam, and Mannárgudi) the mortality rate from fevers was greater than that of the districts.

It is well known that many mistakes occur in registering the causes of death, and that every death put down to fever is not really due to that disease. Fever is a common term in general use by the existing registration agency, and is used to denote the supposed—as the registrars are, as a rule, quite unable to define the real—cause of death. The statement of mortality under fever must, therefore, be incorrect, and many of the deaths recorded under fever result from a great variety of causes besides so-called fever. As mentioned before, there was during 1890 a large increase in the number of deaths registered from "fever," and the cause of this excessive mortality was owing to an epidemic of influenza which prevailed from March to June. Most of the deaths which resulted from influenza and its complications were entered as due to "fever"; and during April, May, and June, when the epidemic prevailed, the mortality was unusually high from this cause. How this disease was brought into the Madras Presidency has not been satisfactorily proved. By some it was asserted that the malady had been imported by direct contagion from parcels, letters, &c. emanating from infected districts, but this was not borne out by facts. Although many believe that the disease is contagious, it does not of course follow that contagion is the only or even the most frequent method of communication. None of the researches have been able to satisfactorily explain the cause of influenza. The erratic and unexpected outbreak of the disease, and the promptness with which it disappears, may account for the fact that we are still strangely ignorant of the causes which preside over its origin and dissemination. The epidemic of 1889–90 would appear to have begun in Siberia in October 1889. It then extended to Russia, Europe, America, and, later, to India and Australia. From December 1889 to March 1890 it prevailed in Great Britain, and from March to June 1890 it was prevalent more or less over all the Madras Presidency. It did not limit its attacks to particular districts or races of mankind, neither did it follow any regular line of march, but spread with wonderful rapidity all over the Presidency. In some districts the disease is reported to have been mild in character, while in others it was severe. During the prevalence of influenza it has been found that the mortality is usually increased, often to a very remarkable degree,

the cause of influenza appearing to exert a power to modify any pre-existing disease with which it may coincide, to impair extensively the vital energy, so as to increase in the population of an affected district the liability to contract other diseases, and also to lessen the ability to resist any degree of fatal tendency which such concurrent diseases may possess. In the Madras Presidency, as before mentioned, there was a rise in the mortality under "fever" during April, May, and June, and this increase in the deaths was chiefly due to disease of the respiratory organs.

Bowel complaints. Bowel complaints caused the deaths of 13,967 males and 12,641 females, or a total of 26,608 persons, against 29,122 in 1889. The death-rate for 1890 (0·9) was less than that of either 1889 (1·0) or 1888 (1·0). The average annual death-rate recorded under bowel complaints during the five years (1885–89) was 1·0 per 1,000.

The district which recorded the highest mortality from this cause was Madras, with a death-rate of 6·7 per 1,000, and Chingleput comes second, with 2·8 per 1,000. Following Chingleput comes South Canara, with a ratio of 2·5 per 1,000, and then Malabar with 1·8. These four districts usually return the highest death ratios from bowel complaints. The lowest ratios were recorded in Vizagapatam (0·2), Kistna and Ganjam (0·3) each. In six districts the death-rate was higher and in 10 lower than in 1889, and in five the rate was the same as that of the previous year.

The greatest mortality was registered during the month of August, but this is not in accordance with the general rule, as January is usually the month in which the maximum mortality occurs. The fewest deaths, as usually happens, were recorded in April.

The rate of mortality from bowel complaints in towns was, as is always the case, much higher than in rural tracts. The death-rate in the towns ranged from 8·2 in Negapatan to *nil* in Ádóni. The two municipalities of the Bellary district were those which suffered least from bowel complaints. Thus, in Ádóni, with a population of 22,441, no deaths from bowel-complaints were registered, and in Bellary, with a population of 53,460, only 12, or a death-rate of 0·2 per 1,000. If the deaths among the civil population were correctly enumerated the death-rate under bowel complaints would no doubt be greater, as the causes of mortality, as registered, are not the real causes, and many deaths from this and other causes are returned under "fevers."

Injuries. Injuries accounted for 10,402 of the deaths registered during the year, the death-rate being 0·4 per 1,000. The mortality from these causes is less by 1,104 than that reported in 1889, when 11,506 deaths were recorded. Under all heads there was a decrease in the number of deaths.

The death-rates from injuries varied in the different districts (excluding towns), ranging from 0·1 per 1,000 in the Nílgiris to 0·5 in each Chingleput, Cuddapah, North Arcot, and South Canara. There were 1,139 deaths among females and 852 among males ascribed to suicide in the whole Presidency. The restraints put upon female life in India may account for the greater number of suicides among the female sex. The deaths ascribed to wounds and accidents numbered 6,369, the largest number (544) occurring in the North Arcot district. Snakes and wild beasts caused 2,642 deaths in 1890, against 2,346 in 1889, the largest number (216) occurring in the South Arcot district.

All other causes. The recorded deaths from causes other than those specified, numbered 287,149 in 1890 against 285,220 in 1889, so that for the year under review there is an increase of 1,929 deaths. The death-rate under this head was 10·1 per 1,000, the same as in 1889.

Sanitary Works.

Municipalities. The number of towns administered by the District Municipalities Act, IV. of 1884, was the same as in the preceding year, viz., 55. The town of Madras has an Act (I. of 1884) of its own.

Sanitary Works.—A good deal of work was done, as usual, in the way of sinking of wells, in the repairing and cleansing of tanks and wells, in the improvement of town sites, and in the construction and repair of latrines, drains, roads, dust-bins, markets, and slaughter-houses, &c. The sources of water-supply and systems of drainage and conservancy were much the same as detailed in former reports. The two former are far from satisfactory in the majority of the towns. Schemes for improved water-supply and efficient systems of drainage have been prepared for some towns and are

under preparation for others, whilst applications have been made to the Sanitary Engineer by many for designs and estimates. Detailed particulars in these respects will be found in the report of the Sanitary Engineer. The system of conservancy pursued was the same in almost all the towns. The street sweepings, refuse matters, and contents of dust-bins and latrines were removed daily by scavengering establishments maintained for the purpose, and carted away beyond municipal limits, and disposed of either by burying in trenches, by being thrown on fields, sold as manure, or consumed in cinerators. In some towns conservancy was fairly well attended to, whilst in others it was either defective or indifferently carried out.

There was an advance made in the system of private scavengering during the year under review, compared with the year before, so far as the number of towns is concerned. It was undertaken by municipal agencies in 43 towns against 39 in the preceding year, having been newly introduced in Bezvada, Guntur, Karur, and Coimbatore. But the number of private latrines, on the whole, under municipal management, fell from 17,500 in 1889 to 17,310 in 1890. There was an increase in some towns and a decrease in others. The total increase in the number of houses thus served, including the towns in which the system was newly put in force, amounted to 1,212, and the total decrease to 1,402, thus showing an aggregate decrease of 190. Excluding the towns which enjoyed the benefits of the system for the first time, there was an increase in the number of latrines brought under municipal management in 14 towns, and a decrease in 19.

The total estimated income of the 55 mofussil municipalities, excluding Madras, amounted to Rs. 21,17,640 during 1890-91 against 20,42,070 in 1889-90, being an increase of Rs. 75,570, and indicating an incidence of Rs. 1-7-3 per head of population against Rs. 1-6-5 in 1889-90. Of this income, Rs. 7,09,092 were sanctioned for sanitation, or 33·5 per cent. The high percentage in Kumbakonam and Vellore is due to provision having been made for a drainage scheme in each of the towns. Of the total sanitary allotment, Rs. 4,20,513, or 59·3 per cent., were spent during the nine months ending December 1889, thus leaving Rs. 2,88,579, or 40·6 per cent., to be spent in the next three months of the year. This cannot be considered as a satisfactory utilization of the funds placed at the disposal of the municipal councils in general for sanitary purposes. Omitting Cuddapah, where the expenditure was exceptionally high, owing to the Bugga water-supply project, which was completed during the year, in only seven towns, Vizianagrum 97·7 per cent., Ootacamund 91·3, Anakapalle 84·6, Guntur 82·4, Kurnool 81·5, Calicut 81·2, and Coimbatore 77·1, the expenditure may be considered as fairly satisfactory. In all the other towns it fell below 75 per cent. In 15 towns it was between 24·0 in Anantapur and 59·8 in Trichinopoly; in 22 it ranged from 60·9 per cent. in Nellore to 69·7 in Parlakimedi; and in 9 from 71·2 in Chidambaram to 73·6 in Vaniyambadi. In Kumbakonam the expenditure shown is very low, only 19·0. But this is owing to the drainage scheme, for which provision was made, not having been taken on hand during the period.

District Local Fund Boards.

There was no change in the number or constitution of the District Local Fund Boards during the year. They were the same in number as in 1889. For the working of the Act V. of 1884, under which district boards have been constituted, each district is divided into district and taluk boards and unions; thus there were during the year 1890–91, 21 district boards, corresponding with the number of districts or collectorates, 86 taluk boards, and 254 unions. Amongst other objects, these local bodies have to provide for such measures as are calculated to promote the health, comfort, convenience, &c., of the rural population.

Sanitary Works.—In the rural tracts no new works of any importance were undertaken during the year. As usual, the sanitary works executed consisted chiefly in the sinking and repairing of wells, in the construction and repair of tanks, latrines, drains, dust-bins, &c., and improvements of village sites, and water-supply generally.

Water Supply, Drainage, and Conservancy.—The chief sources of water-supply were the same as those noted in previous reports, viz., tanks, ponds, wells, rivers, springs, canals, &c. Conservation of the sources reserved for drinking purposes against pollution received increased attention. Drainage consists chiefly of side cuttings to carry off storm water. In some few towns masonry drains exist, but they form no part of a regular system. Drainage from houses either flows into the side cuttings or into drains wherever they exist, or into cesspools, or into the back yards, where they sink in the soil. According to the returns received from the several district boards, there were 815 towns and villages conserved during the year out of a total of 42,862 towns and villages in the 21 local fund districts. Of these, 254 are unions and 561

other villages. In 1889 the number was 746, consisting of 249 unions and 497 other villages; thus 69 more towns and villages, of which five are unions, enjoyed the benefits of conservancy during 1890, and this increased number is accounted for by 96 more towns and villages having been brought under conservancy management and by its abolition in 27 towns and villages.

The total estimated receipts of the 21 districts for 1890–91 amounted to Rs. 81,13,429. Of this amount, Rs. 5,41,254 or 6·7 per cent. were set apart and sanctioned for sanitation. The percentages varied in the several districts from 1·0 in Nílgiris to 13·8 in Kurnool. Madura allotted 12·5 per cent. of its income for sanitary purposes, Trichinopoly 11·5, and Anantapur 10·5 per cent. In 10 districts the percentages were between 9·4 in Tinnevelly, and 5·7 in Vizagapatam. In the other six districts, Nílgiri omitted, the allotments made were below 5 per cent., and ranged from 1·4 in Malabar to 4·8 in Nellore. In Tanjore, 3·6, and South Canara, 2·8, the percentages are low. In Malabar also the percentage is seemingly small, but the circumstances and conditions of the district are such that it was not considered necessary to allot any large amount for sanitation.

Of the total sanitary grant of Rs. 5,41,254, the outlay for the nine months ending December 1890 amounted to Rs. 2,95,127, or 54·5 per cent., leaving Rs. 2,46,127, or 45·4, to be spent during the next three months of the year. This is very unsatisfactory. Excepting in Nílgiris, where the expenditure for the nine months was praiseworthy, 98·9 per cent. of the sanctioned amount, and in Salem, where it was fair, 70·0 per cent., in all the other districts the expenditure incurred in proportion to the amount sanctioned was much below what it should have been for the nine months of the year, especially so in Coimbatore, where the outlay was only 39·6 per cent. of the sanctioned amount, in Madura 40·8 per cent., in Kistna 44·7 per cent., in Vizagapatam 44·9 per cent., in Trichinopoly 47·9 per cent., and in Kurnool 49·0 per cent. In the other districts the percentages of expenditure were between 52·5 in South Canara and 69·8 in Malabar.

Taking the figures for 1889–90, which represent the expenditure for the whole year, out of the total sanitary allotment of Rs. 5,23,028, only Rs. 4,44,409 were spent during the year, or 85 per cent., thus allowing Rs. 78,619, or 15 per cent., to lapse unutilized. In two districts, Kurnool and Nílgiris, the expenditure exceeded even the sanctioned allotment, whilst in some it was satisfactory, and in others the outlay was short. Government have already, in G.O., No. 608 L., dated 14th March 1891, local and municipal, reviewed the transactions of this year in this respect. It is unnecessary, therefore, to dwell further on the subject here.

General Remarks and Personal Proceedings.

I conducted the duties of my office from the commencement of the year till the beginning of July, when I proceeded on three months' privilege leave, and Surgeon-Major W. G. King, who was then Acting Deputy Sanitary Commissioner, was appointed to act for me. I resumed charge of the office on the 7th October and carried on the duties from that date till the end of the year. During the nine months I was in charge I inspected 19 municipal towns and 36 smaller towns and villages. The time I spent on inspection duty was three and a half months. In almost all cases I was, as usual, accompanied in my inspections of municipalities by the chairmen and some of the municipal councillors, with whom I discussed the sanitary defects and needs of their towns, and took advantage of the opportunity to point out to them the more glaring defects of the sanitary condition of their dwellings and surroundings. I also impressed upon them the importance of the positions they respectively occupied as guides to their less favoured and poorer countrymen in all matters connected with the general sanitary improvement of their towns, and showed them how easily, by a little forethought, arrangement and individual energy they could free their dwellings and streets from the filth and rubbish encumbering them, and thus not only preserve their breathing air and drinking water from the multitude of sources of impurity and contamination which now beset them, but also at the same time render their dwellings and their surroundings far more comfortable, wholesome and tidy than they were. At the same time the importance of exercising a careful and strict supervision of the birth and death registration was fully explained. The measures for the removal of sanitary defects are, however, being introduced very slowly, and although systematic reforms in the sanitation of towns are in a backward state and much has yet to be done, still, in many places, a great deal of quiet improvement is being effected from year to year in the general sanitary condition of many towns.

Works for providing a sufficient supply of wholesome water for some towns of the Presidency are being prepared. The waterworks at Cuddapah have been completed, and the water is much appreciated by the people. It will, however, take a long time before projects for supplying the smaller municipalities with abundant pure water are carried out, as waterworks are comparatively expensive. Measures should, however, be taken to protect the supplies in use from pollution as far as possible, and much can be done by the municipal councils if attention be given to the subject, towards lessening, if not altogether preventing, the amount of sewage and other impurities that at present find their way into the water-supplies. The advantages of a wholesome water-supply are so apparent that it should be held to be one of the most important of the public duties devolving upon the municipal authorities to make provision in this direction for their townsmen. All the public wells should be put in a proper sanitary condition, according to the directions of the Army Sanitary Commission, and what might easily be carried out everywhere is the construction of a cistern or reservoir and filter tank in connexion with the parapets or platforms of such public wells as are much frequented, and which, on analysis, are shown to contain usable water. The water could be pumped from the well into the filter tank and drawn at the stop-cock of the reservoir. There is no doubt that the introduction of such filters for public water-supply would prove of immense benefit to the general health of the towns, and, as the cost of their construction is well within the reach of most municipalities, whilst their management requires no skilled labour, there can be no reasonable difficulty in the matter of their general adoption. The filter tank and reservoir should be both built of masonry, and both should be carefully covered over. At Dindigul, the jubilee well has been covered in and the water is pumped up into an iron tank and the water is distributed by means of taps.

In most municipalities, the drainage is still defective and inefficient, but schemes for some towns have been prepared and are under consideration. A great evil in many towns is that the drains, which run along between the streets and houses, have been covered over. At first the shopkeeper or houseowner projects a bamboo shed over the drain, supported by poles, and covers the drain with wood or a brick arch. On this temporary platform, goods are exposed for sale. Later on, bit by bit, the drain becomes arched over and the projection above and the poles alongside are replaced by pucka pillars and roof; the road is encroached on and narrowed for traffic, and the drain, in fact, becomes a part of the house. As it is impossible to clean thoroughly these drains, a good deal of filth accumulates in them. These encroachments exist in nearly every town, and although many encroachments were done before municipal law came into operation, yet in places they are still allowed. Many municipal councils cannot be got to suppress or prevent them, and yet it is very necessary, for many reasons, that such encroachments should be abolished.

With regard to sewage farming in this Presidency, it is carried on in very few places, but there is no doubt that, as drainage schemes for towns progress, sewage will be largely utilised for irrigating and manuring purposes, as it is a very profitable method of disposing of it in this country.

A great fault in most municipalities is the more or less generally faulty organisation and working of the conservancy establishments. The sanitary inspectors, to whom are left the general control and working of the establishments, are usually appointed without any test of their qualifications for the posts, and the men employed under them in the ranks of the conservancy establishments are in cases quite unfit for the work required of them. In fact, where there is an absence of system and method it points to a lack of interest and consideration on the part of the municipal councils, for, unless the councillors themselves take an active interest in the sanitary welfare of their towns, much cannot be expected from the subordinate establishment. One great cause of sickness and death in our towns is the insanitary condition of the private houses and backyards, resulting from the neglect of the most simple measures of sanitation. The extent to which the observance of simple cleanliness in the arrangements of the private dwellings in towns is habitually neglected is most astonishing, and is, above all others, the greatest difficulty we have to contend with in our efforts to improve the sanitary condition of our population centres. Not only is there overcrowding and defective ventilation found everywhere, but no arrangements are made to provide for the wholesomeness of the dwelling as a human habitation. The habitually foul state of the courtyards, and the stalling of cattle under the same roof, and often in the same room, with the owners, are sufficiently serious evils in this respect, but one of the greatest of all evils is the faulty private latrine arrangements. In getting rid of them, or having them constructed on approved plans and daily cleaned by the municipal

servants, many difficulties are experienced. The private sweepers often combine together so that owners are at their mercy. They do not clean the privies daily, nor do they carry the night-soil out of the town and bury it, but throw it into the nearest ditch, jungle, or waste place. I have constantly impressed upon Municipal Councils the advisability of having private latrines cleaned by municipal agency, as not only is this system cheaper to the people, but also the work is more efficiently performed. In towns where this plan has been adopted and attention paid to it, the system has proved a success, both from a sanitary and financial point of view.

The disposal of night-soil is an important subject, on which municipalities were recently addressed, and it is hoped that the Councils will profit by the hints contained in the circular which was sent out.

Very few of the Madras towns have proper cow-houses, and, as milk forms so important an item in the dietary, not only of the young, but also of many adults, no effort should be spared to carry out improvements in the housing of cattle. Proper stables should be built on sites which, for sanitary reasons, ought, if possible, to be outside the town, but, at all events, if they are allowed inside, they should be erected in an enclosed yard on some open spot in the town, and properly cleaned out every day.

Surgeon-Major W. G. King, while Acting Sanitary Commissioner, sent in a report upon the preservation of animal lymph by means of lanoline. Government, on this report, put Surgeon-Major King on special vaccine duty for six months, in order that he might establish five depôts for the making of this "lanoline vaccine," and ordered that District Boards and municipalities were to dispense with their own arrangements for animal vaccination, and all lymph they required was to be obtained from these Government depôts. On my return from leave, I suggested to Government that, as in places animal vaccination was carried on successfully, District Boards and Municipal Councils should have the option of carrying on animal vaccination if they wished, and it was then ruled that municipalities in which vaccination was compulsory would have the option.

In April I proposed that the Vaccine Department be reorganised and placed on a more satisfactory footing than it is at present, and that more Deputy Sanitary Commissioners be sanctioned to supervise effectually the Vaccine Department. The Sanitary Department, as at present organised, consists of one Sanitary Commissioner and one Deputy Sanitary Commissioner, and it is quite inadequate (as was stated in the annual reports for 1878 and 1881), considering the vast area which has to be travelled over. The area of inspection is so large that the visits of the Sanitary Commissioner and his Deputy are necessarily few and far between, and it is quite impossible that two men can efficiently superintend the sanitary wants of such a large Presidency as Madras, and also examine the vaccination work in the different districts.

The following statement shows the area, population, number of towns, villages, vaccinators, &c., of the Madras Presidency :—

Area.	Population.	Number of Towns, including Municipalities.	Number of Villages.	Number of Vaccinators.	Number of Deputy Inspectors of Vaccination.
139,900	30,868,504	77	51,974	811	53

The entire success of vaccination, as a protective agent, is dependent on the effective supervision of responsible officers, and an increase in the number of Deputy Sanitary Commissioners is, therefore, most urgently required in order to maintain more effective supervision over the staff of vaccinators, and also to improve the sanitary condition of towns and villages.

In 1889 a Sanitary Board was sanctioned for the Presidency, but it only commenced its operations on the 1st April 1890, when Mr. Jones, lately the Engineer Vice-President of the Madras municipality, assumed charge of his office as Sanitary Engineer to Government.

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ABSTRACTS OF REPORT OF THE SANITARY COMMISSIONER FOR BOMBAY FOR 1890.

(*Dr. C. W. Macrury.*)

General Population.

Vital statistics.

In the Presidency of Bombay, including Sind, during the year 1890 there were 641,115 births registered against 600,489 in 1889. The recorded births for the year under report were thus 40,626 in excess of the number registered in the previous year, and exceeded the mean of the preceding 10 years ending 1889 by 103,539. By sexes there were 333,698 males and 307,417 females against 312,974 and 287,515 respectively in 1889.

The following table shows the number of births registered in each year from 1880 to 1890, their ratios per 1,000 of population, and the proportion of males to females:—

Years.	Population.	Number of Births Registered.			Ratio per 1,000 of Population.			In every 100 Births there were		For every 100 Male Births the Females were
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	
1880 - - -	16,228,774	195,285	175,588	370,873	12·03	10·82	22·85	52·66	47·34	89·91
1881 - - -	16,454,414	239,912	219,745	459,657	14·58	13·35	27·93	52·19	47·81	91·59
1882 - - -	16,454,414	255,927	235,419	491,346	15·55	14·31	29·86	52·09	47·91	91·98
1883 - - -	16,454,414	261,966	239,835	501,801	15·92	14·58	30·50	52·20	47·80	91·55
1884 - - -	16,454,414	278,986	255,737	534,723	16·96	15·54	32·50	52·17	47·83	91·67
1885 - - -	16,454,414	298,406	274,025	572,431	18·14	16·65	34·79	52·13	47·87	91·83
1886 - - -	16,454,414	303,376	278,177	581,553	18·44	16·90	35·34	52·17	47·83	91·69
1887 - - -	16,454,414	327,500	300,693	628,193	19·90	18·27	38·18	52·13	47·87	91·81
1888 - - -	16,454,414	330,316	304,377	634,693	20·07	18·50	38·57	52·04	47·96	92·15
1889 - - -	16,454,414	312,974	287,515	600,489	19·02	17·47	36·49	52·12	47·88	91·87
Mean for 10 years	16,431,850	280,465	257,111	537,576	17·07	15·65	32·72	52·17	47·83	91·67
1890 - - -	16,454,414	333,698	307,417	641,115	20·08	18·63	38·97	52·05	47·95	92·14

The recorded birth-rate for the year was 38·97 per 1,000 of population against 36·49 in 1889. It is satisfactory to notice that some improvement in birth registration has taken place in several districts.

For every 100 female births 108·55 male births were registered, but this proportion was greater in some collectorates and districts.

The number of births recorded in each district in 1890 was higher than in the previous year. It also exceeded the mean of the preceding 10 years ending 1889. Of the 24 collectorates, the number of recorded births in 1890 was higher than in 1889 in all the collectorates, except Dhárwár, Kánara, Broach, and Ahmedabad. In the City of Bombay the registration of births in 1890 has not apparently been well attended to, as the recorded birth-rate for the year was 19·79 per 1,000 against 19·71 in 1889, whilst the mean ratio for the last 10 years ending 1889 amounted to 20·26 per 1,000 of population. In a subsequent table it will be seen that out of 56 towns in the Presidency the City of Bombay occupies the fifth place from the bottom of the list.

The recorded birth-rates among the urban and rural populations of the Presidency were respectively 28·40 and 40·52 against 27·79 and 37·78 in 1889. Among the rural population of each collectorate, except Kánara, Ahmedabad, Karáchi, Hyderabad and Thar and Párkar, the birth-rates were higher than in the urban population. In 1889 the birth-rates amongst the rural population were higher than in the urban population in each of the collectorates, except Ratnágiri, Kánara, Ahmedabad, Karáchi, and Hyderabad.

Out of 56 towns in the Presidency 13 had a birth-rate exceeding 40 per 1,000. In many towns, however, little attention appears to have been paid to the registration of

births. For instance, in the town of Thána a birth-rate of only 7·54 per 1,000 was recorded against 7·82 in 1889, in the town of Násik a birth-rate of 18·51 per 1,000 was registered against 13·85 in 1889, and in the town of Alibág 20·86 against 21·33. In the towns of Kaira and Broach the recorded birth-rates were respectively 23·97 and 25·88 per 1,000 against 27·61 and 24·08 in 1889. Birth-rates, such as those of Thána 7·54, Kalyán 13·55, Chopda 14·93, Násik 18·51, City of Bombay 19·79, and those returned by Bársi, Alibág, Karad, Jacobabad, Dohad and Kaira are absolutely valueless. These and other municipalities, which have returned apparently equally inaccurate birth-rates, cannot be supposed to have been attending to their duties properly, and I hope Government will be pleased to call the special attention of the authorities to the necessity of much greater attention being paid to this most important subject.

Among the civil population in the rural, town, and cantonment circles in the Presidency, 463,616 deaths were registered during the year 1890. In 1889, 518,562 deaths or 54,946 more than in 1890, were recorded. The following statement shows the number of deaths recorded in each year since 1880:—

1880	- 328,673	1884	- 408,409	1888	- 468,039
1881	- 381,450	1885	- 473,591	1889	- 518,562
1882	- 343,418	1886	- 381,185	1890	- 463,616
1883	- 420,198	1887	- 455,261		

The year under report, as compared with 1889, was, therefore, on the whole, healthier.

Of the total deaths registered 242,835 occurred among males and 220,781 among females against 270,992 and 247,570 respectively in 1889.

The computed death-rate per 1,000 of population in 1890 was 28·18 against 31·51 in 1889 and a decennial mean of 25·43. Omitting Sind, where registration is defective, the recorded death-rate in the other parts of the Presidency amounted to 29·31 per 1,000 of population against 33·06 in 1889.

The millesimal ratio of males dying to males living was 28·58 and of females dying to females living 27·75. In 1889 these ratios were respectively 31·89 and 31·11. For every 100 females who died 109·99 deaths among males were recorded, but these proportions varied considerably in some collectorates.

The recorded death-rate per 1,000 of population was higher than in 1889 in the collectorates of Ratnágiri, Kánara, Kaira, Ahmedabad, and Upper Sind Frontier. In the collectorates of Sátára and Shikárpur the recorded death-rates (30·97 and 24·17 per 1,000 respectively) during the year were nearly the same as those for 1889 (30·65 and 24·21). In the remaining collectorates it was lower than in 1889. In Násik the recorded death-rate (29·64 per 1,000) during the year was considerably lower than that for 1889 (45·19). The recorded death-rate per 1,000 of population in 1890 was higher than the annual mean of the preceding 10 years in all the collectorates, except Thána, City of Bombay, Kolába, Poona, and Surat. In Násik and Ahmednagar the death-rates (29·64 and 29·95 per 1,000 respectively) were nearly the same as those of the annual mean of the preceding 10 years (29·95 and 29·62).

In the City of Bombay, Broach, and Ahmedabad, the recorded birth-rate was below the registered death-rate. In the City of Bombay they were respectively 19·79 and 26·17 per 1,000 of population; the difference may be partly ascribed to defective registration of births. In Broach and Ahmedabad the recorded birth-rates were respectively 36·67 and 33·10 and the death-rates 39·32 and 40·95 per 1,000 of population. In the collectorate of Kánara the recorded birth and death-rates were nearly equal—31·38 and 31·45 per 1,000 respectively. In all other collectorates the recorded birth-rates were higher than the registered death-rates.

The mortality amongst infants under one year and children above one year but under five was, as usual, very high in comparison with other periods of life. In fact, the deaths among children under five years of age formed 42·77 per cent. of the total deaths. The period of greatest immunity was in the age of above 10 and under 15, the rate being 5·68 per 1,000. The percentage on total deaths amongst infants under one year was 21·22 against 20·77 in 1889. For those above one and under five the percentage on total deaths was 21·55 against 22·36 in 1889. Among old people 60 and upwards the percentage on total deaths was 14·62 against 13·44 in 1889.

According to the census of 1881, the Mahomedan population numbered 3,107,171 persons, amongst whom, in 1890, 72,307 deaths were recorded against 76,596 in 1889, the death-rate being 23·27 per 1,000 of population against 24·65 in 1889. The Hindu population amounted to 13,128,587 persons, amongst whom 386,095 deaths, or 29·41

per 1,000 of population, were reported during 1890. In 1889 the total deaths amongst this race were 436,178, equal to a death-rate of 33·22 per 1,000 of population. Amongst the Christian population, numbering 138,326 persons, 2,270 deaths were reported during the year against 2,437 in 1889, the death-rate being 16·41 against 17·62 per 1,000 in 1889. Under the heading "Other castes" are included all those not belonging to either of the above sects, who by the census of 1881 numbered 80,330 persons, amongst whom during 1890 there were 2,944 deaths against 3,351 in 1889, the death-rate being 36·65 per 1,000 against 41·72 in 1889. Amongst Mahomedans the maximum death-rate during the year (39·77 per 1,000) took place in the collectorate of Ahmedabad and the minimum (13·59) in Thar and Párkar. In 1889 these rates were 43·07 and 12·46 and were reported as having occurred in Násik and Thar and Párkar. Amongst Hindus the maximum death-rate (41·14 per 1,000) in 1890 was also in the Ahmedabad collectorate, and the minimum (19·08) in Ratnágiri. In 1889 these rates occurred in Násik and Ratnágiri, 45·42 and 18·32 respectively. The maximum death-rate during the year amongst Christians was 26·40 and was reported from the Kánara collectorate, and the minimum (1·74) from Khándesh. In the collectorates of Broach, Panch Maháls, Thar and Párkar, and Upper Sind Frontier no deaths amongst Christians were reported in 1890.

The subjoined table shows the deaths in 1890, arranged according to the specified causes laid down by the Government of India, and contrasted with the results for 1889 and the mean of the preceding ten years. The causes of deaths will be briefly noticed in the next section:—

Causes of Death.	Mean for 10 Years, 1880–1889.		1889.		1890.	
	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.
Cholera - - -	20,913	1·27	32,431	1·97	3,259	0·20
Small-pox - - -	4,891	0·30	7,066	0·43	2,877	0·17
Fevers - - -	286,210	17·42	346,878	21·08	344,897	20·96
Dysentery and diarrhœa - -	37,238	2·27	48,202	2·93	36,037	2·19
Injuries - - -	5,799	0·35	5,941	0·36	5,883	0·36
Other causes - - -	62,828	3·82	78,044	4·74	70,663	4·30
All causes - -	417,879	25·43	518,562	31·51	463,616	28·18

The recorded death-rates among the urban and rural population of the Presidency were respectively 29·80 and 27·96 against 33·12 and 31·30 in 1889.

Chief Diseases.

Cholera caused 3,259 deaths during 1890 throughout the Presidency. The epidemic prevailed chiefly in the Sátára and Belgaum collectorates, where 1,051 or 0·98 and 809 or 0·93 deaths per 1,000 of population respectively took place; whilst the minimum mortality occurred in the Surat, Hyderabad and Kaira collectorates, in which there 1, 9, and 25 deaths respectively registered.

Cholera. In January cholera broke out in 8 collectorates and caused 505 deaths. In February the disease prevailed in 6 collectorates, causing 114 deaths, and disappeared from 3 collectorates, namely, Belgaum, Ahmedabad, and Hyderabad. In March 24 deaths from cholera were returned from 3 collectorates. In April cholera ceased in all the collectorates except Khándesh and Ahmedabad, where 2 deaths occurred, the monthly minimum for the year. In May 15 deaths were registered—1 in Khándesh, 1 in Bombay City, 5 in Ratnágiri, 7 in Belgaum, and 1 in Ahmedabad. In June the disease increased and caused 201 deaths, of which 144 occurred in the Belgaum collectorate. In July there were 365 deaths recorded in 10 collectorates. In August the disease increased, and the mortality rose to 706, the maximum for the year, and prevailed more or less in 7 collectorates. A decrease took place in the month of September, 299 deaths having been reported. In October cholera caused 443 deaths. In November there were 227 deaths from this disease in 7 collectorates, whilst in December 358 deaths from the same cause took place in 9 collectorates. Dhárwár, Kánara, Broach, Thar and Párkar, Shikárpur and Upper Sind Frontier were free from cholera throughout the year.

The death-rate attained the high ratios of 0·98, 0·93, and 0·76 per 1,000 in the Sátára, Belgaum, and Karáchi collectorates. In Thána, Sholápur, Panch Maháls, Bombay (city) and Kolába the ratios were 0·28, 0·27, 0·18, 0·12 and 0·15 respectively.

The affected area included 377 out of 24,535 villages in the Presidency. The highest percentage (13·99) took place in the Karáchi collectorate, where out of 722 villages 101 were affected. In Sátára, Belgaum, and Sholápur collectorates the percentages were 7·31, 5·96 and 4·9 respectively, and in the remaining collectorates the percentages were below 4 per cent.

Small-pox.

During 1890 there were 2,877 deaths from small-pox (1,507 males and 1,370 females) against 7,066 in 1889 and a decennial mean of 4,891.

In the Southern Registration District small-pox attained a ratio of 0·30 per 1,000 against 0·53 in 1889 and a decennial mean of 0·45. In the Western Registration District the ratio was 0·20 against 0·42 in the previous year and 0·41 the decennial mean. In the Sind Registration District it was 0·19 against 0·90 in the previous year and a decennial mean of 0·27. In the Eastern Gujarát and Central Registration Districts the ratios per 1,000 of population were respectively 0·13 and 0·8 against 0·15 and 0·29 in the previous year and a decennial mean of 0·11 and 0·23. In collectorates the highest death ratios (0·84 and 0·63) took place respectively in Kánara and Broach, and the lowest (0·01) took place in Ahmednagar and Ahmedabad; the Presidency rate being 0·17 against 0·43 in the previous year and 0·30 the decennial mean.

In 1890, 24·19 per cent. of these deaths occurred among infants under 1 year of age, whilst 52·97 per cent. took place among children over 1 and under 12, the remaining 22·84 per cent. being among persons over 12 years of age.

Fever.

During 1890, 180,054 males and 164,843 females, or a total of 344,897 persons, were reported to have died from fever against 346,878 in 1889, showing a decrease of 1,981 deaths for the year, the mean for the previous 10 years being 286,210.

In the Eastern Gujarát Registration District fever caused a higher mortality (29·54 per 1,000) during the year than in 1889, when the rate was 27·36, the decennial mean being 23·61. In the Sind, Southern and Central Registration Districts the death ratios were respectively 19·68, 19·55, and 19·41 against 19·38, 17·88, and 20·04 in the previous year, and 14·13, 14·92, and 16·50 the decennial mean. In the Western Registration District the ratio for the year was 18·32 against 20·98 and 17·73 in the previous year and the 10 years' mean respectively. In 12 collectorates out of 24 the fever death-rate was higher than that of the previous year. The collectorate of Ahmedabad heads the list with the very high ratio of 34·91 against 30·19 in 1889 and 23·81 in the previous 10 years. In the following collectorates high death ratios occurred:—Broach 33·78, Kaira 30·37, Sholápur 26·27, Khándesh 24·86, Sátára 24·43, Shikárpur 23·51, Násik 22·79, Surat 22·26, Ahmadnagar 21·67, Dhárwár 21·20, Panch Maháls 21·10, and Bijápur 21·04—the Presidency rate being 20·96 against 21·08 in the previous year and 17·42 the decennial mean.

From January to April and in November and December the deaths from fever were both above the mean and the corresponding months in the previous year. From May to October the deaths were only above the mean and less than the previous year. The maximum mortality from fever took place in April, when 42,786 deaths were reported, and the minimum in June, when 20,962 deaths were recorded from this cause. A certain proportion of the mortality in April may be attributed to influenza.

Dysentery and diarrhœa.

Under the orders of the Government of India this heading (dysentery and diarrhœa) has been substituted for that of bowel complaints.

During 1890 dysentery and diarrhœa caused the deaths of 19,682 males and 16,355 females, or a total of 36,037 persons against 48,202 in 1889, and a decennial mean of 37,238.

The Southern Registration District heads the list with the high ratio of 5·32 per 1,000 against 6·34 in 1889 and 4·19 the decennial mean. The Western Registration District comes next with a ratio of 2·39, the Central Registration District 2·01, the Eastern Gujarát Registration District 0·81, and Sind Registration District 0·16. In the Presidency the rate was 2·19 against 2·93 in the previous year, and a decennial mean of 2·27. Excepting in the collectorates of Ratnágiri, Kánara, and Upper Sind Frontier District, the death-rate for the year was lower in all the collectorates. The highest ratios recorded were in Belgaum 6·99, Dhárwár 5·65, and Bijápur 4·92, and the lowest in Hyderabad 0·06 and Thar and Párkar 0·03.

During the year, without exception, the deaths from dysentery and diarrhœa were less than in 1889, but exceeded the mean in the months of January, March, April,

July, and August. The maximum mortality occurred in August, and the minimum in February and May.

Injuries. During 1890, 3,383 males and 2,500 females, or a total of 5,883 persons met with violent deaths. The mortality from these causes is less by 58 than that reported in 1889, when 5,941 deaths were recorded. Of the 5,883, 2,429 happened from drowning, 1,218 resulted from snake bites, 616 from wounds, 192 from hanging, 126 from poisoning, 81 from attacks by wild beasts, and 1,221 from causes not specified.

Other causes. The recorded deaths from causes other than those specified number 70,663, of which 36,450 occurred among males and 34,213 among females. The total for 1889 was 78,044. There is a decrease of 7,381 under this head.

Sanitary Works—Military and Civil.

All available information under these sections has been thrown into tabular form and will be found in Appendices Nos. III. and IV., as directed in paragraph 5 of Government Resolution No. 3,393, General Department, dated 28th September 1888.

General Remarks.

Notes were taken of the sanitary condition of the different places visited on tour. There is little that is new in these notes, which are merely a reiteration of observations on conditions affecting the public health that must be continued from year to year with unwearying importunity until the desired improvements are affected and the death-rate has been reduced to a normal figure throughout the Presidency.

Summary of the Health Officer's Report.—The Health Officer of the Port has submitted a very interesting report, giving full details of the arduous duties performed by him during the year, a summary of which is here given.

The following table gives a summary of the shipping and health of the port:—

Vessels including Native Craft.	Number.	Number of Crews and Passengers.	Number of Vessels inspected.	Number of Persons inspected.	Number of Vessels disinfected.	Number of Persons vaccinated.	Diseases and Number of Cases of each.								Number of Boats with suspicious Cargo.
							Cholera.	Small-pox.	Measles.	Scarlatina.	Leprosy.	Chicken-pox.	Bovine Disease.	Equine Disease.	
Entered - -	47,864	398,574	21	14,589	16	1,408	—	13	13	—	—	1	—	—	5
Left - - -	37,981	399,916	625	56,262	—	—	—	—	—	—	—	—	—	—	—
In harbour including population -	1,471	24,887	5	—	5	—	4	1	—	—	—	—	—	—	—
Total - -	87,316	823,377	651	70,851	21	1,408	4	14	13	—	—	1	—	—	5
Total, 1889 -	102,919	842,641	692	105,740	45	3,115	29	28	—	6	—	3	—	5	3

The following table shows the actual number of ships which arrived with infectious disease on board:—

Class of Vessel.	Number of Ships.	Total Number of Crews and Passengers.	Diseases and Number of Cases of each.							Suspicious Cargo.
			Cholera.	Small-pox.	Measles.	Scarlatina.	Chicken-pox.	Bovine Disease.	Equine Disease.	
1. Troopships -	3	4,667	—	—	13	—	1	—	—	—
2. Pilgrim ships -	6	4,823	—	8	—	—	—	—	—	—
3. Other vessels -	3	639	—	5	—	—	—	—	—	—
4. Vessels with suspicious cargo (bundles of hides from Zanzibar).	5	229	—	—	—	—	—	—	—	5
Total - -	17	10,358	—	13	13	—	1	—	—	5
1889 - -	14	10,645	4	24	—	6	—	—	—	—

The measles cases on board Her Majesty's Indian troop-ships were practically convalescent on arrival, and were landed and isolated in the military cantonment at Colába. The six pilgrim vessels which had small-pox on board were quarantined until the unprotected had been vaccinated, when the passengers were allowed to land, and the ships were fumigated and disinfected. The three other ships mentioned in the above table were also fumigated and disinfected.

In the last column of the above table five arrivals were shown under the heading "Suspicious cargo." This refers to arrivals of vessels from Zanzibar and East African ports, where in April bovine epidemic disease (spleen fever) was reported to be raging. These vessels with hides from the above-mentioned ports were detained on arrival at Bombay until a veterinary inspector had examined the hides and certified that they might be passed into the town.

Owing to the severe outbreak of cholera at Mecca and Jedda during the Hedjaz of 1890, all pilgrim vessels returning from Jedda were inspected on arrival and their diaries carefully examined. There were, it is thought, grounds for suspecting that some of them at least were cholera-infected vessels, but that the disease had died out on the voyage. It is satisfactory to be able to add that no increase in the Bombay cholera deaths followed on their arrival here.

The following table furnishes the details of the outward-bound vessels inspected during the year by the Health Officer of the Port :—

No.	Class.	Number of Vessels.	Tonnage (Net).	Total Number of Crews, Passengers, Pilgrims, and Troops.
1	Square-rigged vessels and steamers	393	718,492·66	38,331
2	Native craft	218	27,011·31	5,240
3	Pilgrim ships	14	19,788·08	12,691
4	Her Majesty's Indian Troop and Marine ships	21	85,874·50	19,637
	Total	646	851,166·55	75,899
	1889	640	883,506·88	73,667

During the year's inspection of outward vessels only six cases of infectious disease were discovered and removed from the vessels prior to sailing. Two of these were cases of leprosy, two of chicken-pox, one of pustular small-pox, and one of opthalmia. This last case was removed by the commander of the vessel on his own responsibility.

In only two instances did infectious disease dangerous to life declare itself after departure from Bombay on vessels which had been inspected. These instances were both pilgrim cases, the pilgrim-vessels S.S. "Tanjore" and the S.S. "Deccan," and the diseases were small-pox, chicken-pox, and cholera.

Quarantine.—During the year quarantine was not imposed at any foreign port against arrivals from Bombay.

Cholera during Hedjaz.—The Hedjaz took place on the 28th July and was signalized by one of the severest epidemics of cholera on record. Cholera was, it is believed, introduced by a caravan of pilgrims from Damascus, and was in no way due to importation by the S.S. "Deccan" from Bombay, whose passengers were attacked by cholera eight days out from Bombay, and who owing to quarantine at Camaran never reached Jeddah at all, but were brought back to Bombay in September!

Foreshore.—Although a marked improvement has generally taken place, still in particular localities the state of the foreshore is most unsatisfactory.

Causes of Insanitary State of the Foreshore.—The insanitary state of the foreshore, generally speaking, is due to two causes, viz. :—

(1.) Insanitary habits of the people, as evidenced by the deliberate pollution of the foreshore by night-soil and refuse of all sorts.

(2.) The system that admits of night-soil from latrines and a night-soil depôt discharging into the harbour above low-water-mark and at varying states of the tides.

The Remedy.—The Port Trustees, possessing, as it is believed they do, legal powers to prevent the fouling of their property, should insist on all drains being either diverted or extended to below low-water mark and on the cessation of latrine discharges into the harbour. Properly constructed sewage outfalls at Colába and Mázgaon, which should discharge by gravitation below low-water mark and during ebb tides only, would be a desirable improvement on the present insanitary arrangements, besides draining and drying the sub-soil of the neighbouring districts.

ABSTRACT OF REPORT OF THE CALCUTTA MUNICIPALITY FOR 1890-91.

(*Mr. H. Lee, Chairman.*)

The Census of Calcutta.

The census of Calcutta for 1891 was taken on the night of the 26th February, exactly 10 years since the last census. It was arranged that the expenses should be borne equally between Government and the Corporation.

Area.—The limits of Calcutta have been largely increased by the amalgamation of the urban portion of the suburbs under Bengal Act II. of 1888. The added area consists of part of Chitpore, Ooltadingee, Manicktollah, Baliaghatta, and Entally thanas, and of the whole of all the other thanas of the suburbs, except those known as Garden Reach and Tollygunge. A small portion in the south-eastern corner was added from the South Suburban Municipality. The increase in the area of Calcutta is from 3,754 to 11,850 acres, or from six to eighteen and a half square miles. The area has been increased by over 300 per cent., the population by nearly 50 per cent.

Population.—The population of Calcutta on the night of the 26th February 1891 was found to be—

	Males.	Females.	Total.
In the old town - -	2,87,034	149,359	4,36,393
In the added area -	1,28,007	85,001	2,13,008
In the fort - -	3,119	349	3,468
In the port - - -	26,515	73	26,588
In the canals - -	2,072	30	2,102
Total -	4,46,747	2,34,812	6,81,559

The density of the population is still greatest in Ward VIII., Colootolah (226 to the acre), while Ward V., Jorabagan, now occupies the second place, with 161 to the acre, and other wards which are thickly populated are VI., Jorasanko (159), X., Bowbazar (154), XIII. and XIV., Fenwick Bazar and Taltollah (147), XI., Puddopooker (125), II., Coomertoolly (122), IV., Sukeas Street (108), and IX., Moocheepara (107), while in Wards XXI. and XXIII., Ballygunge and Alipore, the population is only 11 to the acre. The population has been found to have specially increased in Ward VI. from 32,824 to 41,657. It has also increased considerably in Wards I. and IV. All the wards, except XVII., Theatre Road, either vary very little or show an increase on the figures of 1881. The increase of population in Ward VI. appears to be due to the migration of a number of the residents from Wards VIII. and IX. after the acquisition of their premises for the new Central Road. The decrease in Ward XVII. may be accounted for by the obliteration of large bustees between Camac Street and Elysium Road.

House Accommodation.—The number of houses in Calcutta, including the amalgamated area, on the night of the census was—

	No.
Pucca houses - - -	25,949
Kutcha houses - - - -	47,276

Of the *pucca* houses, 23,622 were occupied and 2,327 unoccupied. Of the kutcha houses, 43,921 were occupied and 3,355 were unoccupied. The number of male inhabitants in the 67,543 houses was 413,748 and of females 234,342, so that each inhabited house contained on an average nine persons. In many parts of the town there is no room for more houses.

Sex.—The returns of the old town, as regards sex, may thus be compared with those for 1881 :—

	Males.	Females.	Total.
1881 - - -	2,57,778	1,43,893	4,01,671
1891 - - -	2,87,034	1,49,359	4,36,893

The figures for the suburbs cannot be usefully compared.

As regards conjugal condition, the figures for the whole town yield the following percentages on the total population and on each sex:

	Out of Total Population.		Total.	On each Sex.	
	Male.	Female.		Male.	Female.
Single - - - -	19·6	8·7	28·3	30·5	24·4
Married - - -	42·0	16·3	58·3	65·5	45·2
Widowed - - - -	2·5	10·9	13·4	4·0	30·4
Total -	64·1	35·9	100·	100·	100·

At the last census the percentages were—

Single - - - -	20·5	7·9	28·4	32·2	21·7
Married - - -	40·3	15·5	55·8	63·2	42·7
Widowed - - - -	2·9	12·9	15·8	4·6	35·6
Total -	63·7	36·3	100·	100·	100·

Religions.—The population of Calcutta according to religions shows :—

Hindoos.	Mahomedans.	Christians.	Buddhists.	Jains.	Jews.	Zoroastrians.	Sikhs.	Brahmos.
4,28,760	1,29,226	26,406	2,145	493	1,387	168	108	708

The following is an extract from the concluding remarks in the Report of the Special Census Officer, Mr. H. F. T. Maguire, C.S. :—

"The condition of Calcutta is still one of progress, but this progress affects the day population more than that which may be found on any given night. It is also clear that such expansion, as has been observed, has taken place in Ward No. VI., which was previously the least densely populated ward in the heart of the town and in other wards where there was more room for expansion. It is further shown that the main population of Calcutta is not home-born but imported, and that the immigrants are generally of the male sex only, which accounts for a disproportion of males to females by almost two to one."

Town and Bustee Improvements.

It will be seen from the Annual Report of 1889-90 that the amount available for bustee and structural improvements for 1890-91 was Rs. 1,39,695-7-10. To this were added during the year contributions, &c., amounting to Rs. 1,97,150,0-7. The expenditure actually incurred and adjusted in the accounts has been Rs. 1,09,334-9-5.

Bathing Platforms.—Only one new bathing platform opened to the public during the year. This is at No. 2, Bonomally Sircar's Street. The Commissioners also purchased land for a new platform at No. 6, Kripanath's Lane.

Acquisition of Tank Sites as Dumping Grounds.—An estimate amounting to Rs. 88,103-12-2 for acquiring five tank sites, situate on the suburban side of the Upper Circular Road, to be used as depositing grounds for road scrapings, building rubbish, earth, &c., has been sanctioned. It was represented that there was a large quantity of earth now in hand in the section of the Central Road adjacent, which could be

made available for these tanks, the water of which has been condemned as unfit for use. Provision for this expenditure has been entered in the Budget. An allotment for a smaller number of wagons was passed in the Budget, because the intention was not to send road scrapings and gully-pit silt to the lakes. The land representing the filled-up tanks can afterwards be sold for more than it will cost. The Commissioners in meeting approved generally the proposal, but directed that, if the sites could be acquired on advantageous terms on a mowrassee pottah or lease, such a lease should be entered into in preference to acquisition.

Town Improvements.—The contribution on this account from revenue was Rs. 30,000. But the Commissioners added to this Rs. 24,000 from the fund available for bustee improvements and divided the total amount amongst the 12 wards 1 to 10, 13 and 14, *i.e.*, Rs. 4,500 for each ward. These are for petty improvements only. All larger and important constructions are undertaken separately. These improvements are independent of all works carried out as bustee improvements. The expenditure incurred on this account, as adjusted during the year, was Rs. 40,017-0-5.

Public Health and Convenience.

The Health Officer has submitted three valuable and interesting reports; one on the vital statistics of Calcutta and the work performed in his department during the year; another on pilgrims and cholera, with special reference to the importation of the disease into the town by pilgrims coming from the surrounding districts, to bathe in the river on solemn festivals; and the third on the organization of the department under him. These reports will be found in the Appendices.

Birth-rate (*Calcutta proper*).—In accordance with previous practice the vital statistics are again treated separately for Calcutta proper and for the amalgamated portion of the suburbs, but with the concurrence of Government the Commissioners will, in future reports, deal with them also jointly. The Health Officer's Report is for the calendar year 1890, and not, as the rest of the report, for the financial year. This is in accordance with the orders of Government. The number of births in the town proper was 7,948, which, calculated on the census population of 1891, gives the birth-rate at 17 per 1,000 against 17·4 and 17·2 in 1880 and 1881 respectively.

Death-rate (*Calcutta proper*).—The number of deaths from all causes was 12,382 against 11,682 in 1889. The rate was 26·5 per 1,000 of population calculated on the census of 1891. Although the number of deaths exceeded that of the previous year by 700, the mean for the quinquennium was only 24·9, showing that it has been the healthiest since 1866, when the statistics were first recorded. The higher death-rate of the year may be attributed to fever, the mortality from which was 626 above the mean of the past 10 years. The Health Officer thinks that this has been caused by the sewers, which, when flooded, leak and pollute the soil of Calcutta and its sub-soil water. This condition is a very important factor in the causation not only of fevers but also of other diseases included under the general heading of "other causes." Moreover, an epidemic of influenza in the beginning of the year, by lowering the vitality of the inhabitants, rendered them more liable to the existing insanitary conditions of the town; and another contributory cause was a smart epidemic of small-pox, causing 700 deaths. Special attention will have to be given for some time to come to the defects in the sewerage system, pointed out by the Health Officer and recently re-affirmed by Mr. Baldwin Latham.

Cholera.—The deaths from cholera in Calcutta proper amounted to 963 in 1890 against 1,079 in 1889. During the last 21 years in which the town has had the benefit of the filtered water supply, only two years show a lower number of deaths from cholera than 1890. The following quinquennial table indicates the effect of a good and ample water supply on mortality from cholera—a point that is dwelt upon by Dr. Simpson at some length:—

Quinquennial Period.	No. of Deaths.	Ratio.	Remarks.
1866—1870	18,422	8·5	
1871—1875	5,922	2·7	Water introduced.
1876—1880	6,598	3·0	
1881—1885	9,845	4·5	Water scarce.
1886—1890	6,773	2·8 (new population).	Scarcity of water remedied in 1888.

A notable feature of the cholera mortality of the year, which, it will be remembered, is the calendar year 1890, in the town proper was a sudden outbreak from the 31st January to the 13th February, which seems to have been attributable to emanations from drains infected with cholera *dejecta*. The Health Officer clearly shows that the outbreak was confined to particular localities, to which the disease was imported by the arrival of infected persons from the districts surrounding Calcutta.

Special Arrangements for Influx of Pilgrims.—It was during January and February 1891 that a very large influx of pilgrims from the mofussil gathered round about Kalighat (in the amalgamated area) on account of the *Ardhodoya Jog* festival. There was an unusual strain on the Health Department to meet the emergency. No time was lost in making the necessary arrangements. A large house was leased and converted into a hospital for patients affected with cholera and other diseases. Two resident doctors were appointed, nurses provided, and the hospital fully equipped. A camp was also established to give shelter to pilgrims too poor to obtain lodgings. Special public latrines, attended to by the municipal mehters, were erected at convenient places. A large number of mehters were detailed off to remove daily all fœcal matter that might be discovered on the banks of Tolly's Nullah. Special attention was given to the water supply, the pressure in the mains being kept up longer than usual, so that water could be obtained from the standposts for at least 18 hours out of the 24, and all the available water carts, 23 in number, were sent down to Kalighat with Calcutta water to be replenished morning and evening. The assistance of the police was asked for and cordially given for the purpose of tracing out and sending to hospital sick people, and generally helping the Health Department. At least 150,000 persons came into Calcutta in the first and second weeks of February. The result of such a large gathering of pilgrims was that the number of cholera deaths in Kalighat, during the period mentioned, amounted to 238 among the pilgrims and 19 among the residents.

Influenza.—Immediately before the commencement of the hot season, influenza was imported into Calcutta by certain Bombay merchants, who travel backwards and forwards between the two cities on business, and from whom it spread, through the business quarters, all over the town. It was fortunate that the hot weather reduced the epidemic into a mild type, so that it caused fewer deaths than in other towns. There was a recrudescence of the disease in January and February 1891, but owing, probably, to the cold weather, the malady was much more severe in character. The second appearance could not be traced to importation, but seemed to be a revival of the former epidemic.

Small-pox.—The deaths from small-pox amounted to 700. The epidemic commenced in the beginning of 1889, was kept under control during the rains, but re-appeared in an aggravated form in November. From December it began to increase and reached its height in March 1890. It disappeared in August. The epidemic was of a severe type and attacked persons previously protected by vaccination and inoculation, as well as those protected by a previous attack of natural small-pox. In consequence of the severity of the epidemic, a larger number of persons were vaccinated than in previous years, and vaccination was introduced into several Marwaree and Khettry families for the first time, where it could not be introduced before on account of their anti-vaccination prejudices. The wards inhabited by Europeans and resident Bengalees are better protected than those inhabited by up-country people.

Suburban Area.—There were 3,970 births in the amalgamated area, giving a rate of 18·4 against 3,565 in 1889, equal to a birth-rate of 16·4 per 1,000. The increase is doubtless due in part to greater care in registration. In this connexion the important point is brought out that the population of the suburban area being very much larger than was thought for, the death-rate in that area has been, of recent years, very much less than it has generally been quoted. It should be calculated on a population of 2,13,008 (according to the last-revised figures) instead of 1,68,000. So that the usual calculation of the rate has erred in excess by nearly one-third. There were 7,986 deaths registered in the amalgamated area in 1890, which is equal to 36 per 1,000 of the population, against 7,882 in 1889. Kidderpore and Alipore presented the highest death-rate. Kidderpore showed the highest fever-rate, and this was attributable to obstructed drainage from the excavation of the docks.

Building Regulations.—The Health Officer has drawn attention to his remarks in the last Annual Report anent the building regulations, and has urged that unless these

regulations are altered, there will be a repetition of some of the worst types of houses and of overcrowding in the Burra Bazar and Jora Bagan sections. Apart from the important health question involved in allowing similar insanitary localities to spring up in every part of the town, the practice, remarks the Health Officer, is one which will lead, in future, to embarrassing costliness in order to demolish that which should not be allowed to remain in the interests of public health.

Burning of Refuse.—Mr. Harrington's incinerator, consisting of eight furnaces, began to work from May 1890, and continued its operations throughout the rains up to the 3rd October 1890. At first the working was handicapped for want of a roof over the furnaces and of drainage to carry off the rainfall from the surrounding grounds, which soaked the walls of the furnaces and flooded the hearths and ash-pits. When these defects were remedied, it became apparent that the furnaces could first dry and then burn any refuse, however wet. During the rainy season a daily average of 72 large cart-loads of refuse were consumed. On the 3rd October the fire was put out for certain alterations to be made in the building. The chimney was raised from 132 to 200 feet, and two of the furnaces were altered, so that they could burn from 5 to 7 cart-loads more than before. A crematorium was also constructed for consuming the smoke. On completion of these alterations, the incinerator was again lighted on 5th December, and was working when the year closed. After the alterations a daily average of 89 cart-loads of refuse were burnt; each cart-load contained on the average 35 cubic feet of refuse.

The question of the possibility of burning refuse at all seasons has been settled. The returns show that Mr. Harrington's incinerator burnt its refuse in satisfactory quantities, thoroughly and regularly; and it is easily workable without skilled labour or excessive supervision. It was found, however, that it did not consume its own smoke, and this is a defect that ought to be overcome if incinerators are to be a complete success in the thickly inhabited portions of the municipality. The incinerator was paid for and taken over by the corporation, but after working for some time was stopped, pending the settlement of the smoke question. Mr. Baldwin Latham recommends the introduction of a smoke consuming chamber of the most approved kind, with fire-bars of a particular pattern and the employment of several layers of coke and fuel raised to an incandescent heat. The Health Officer remarks, in the course of his elaborate report on this branch of the subject: —

"The second question therefore can, I think, be safely answered in the affirmative, that the refuse can be burnt without any nuisance from the chimney, and here some reference may be made to the supposed bad effects arising from the smoke of the present incinerator, which is peculiarly placed in that it is situated immediately south of a large hospital and in the vicinity of a well-populated district. Careful inquiries have not elicited any facts of ill-effects caused by the incinerator. This smoke blew steadily into the hospital for four months, yet beyond the inconveniences arising from the circumstance, nothing occurred in the health of the patients which could be attributable to the inhalation of the smoke. Complaints were made by the inhabitants in the neighbourhood as to annoyance experienced when the wind drove the vapour from the chimney in their direction and certain sore throats were considered to have been caused by the incinerator, but similar sore throats prevailed in the town and suburbs in directions in which the smoke from the chimney could not operate. The incinerator has also been blamed for the recrudescence of influenza. With as much reason it ought to have been blamed for the recrudescence of this disease in different parts of the world. From a sanitary point of view, I should be the last to recommend any system that would in the slightest degree have a chance of polluting the air or even causing annoyance to the inhabitants, because the purpose of the whole incinerator scheme would thus be nullified if one bad system was merely to be substituted for another, and for this reason the efficient burning of the smoke should be insisted upon, but at the same time it can serve no good purpose to be misled by a number of alarming reports which have not the slightest foundation in fact."

Importance of Incineration.—Of the utility to the corporation of a thoroughly efficient system of incineration, there can be no shadow of doubt. Its advantages must be immense on the score both of health and economy. On this Dr. Sampson remarks:—

"In referring to the cost I shall not deal with the introduction of the system into the town proper for at the present stage it would be probably premature, and I am not in a position to recommend its substitution for the present system with all its danger, but with the suburbs the question is on a totally different footing. There we are quite on

a virgin soil. The disposal of the refuse of the suburbs must be undertaken, and it is here where the two systems can be best compared as to cost. There is no comparison between them from a health point of view."

And then he proceeds to show conclusively how vast would be the yearly saving in cost of the "incineration" over the "dumping" system for the suburban part of the town.

The incinerator ash seems to be of but little value as manure, but it could be utilised in making a kind of patent stone and for repairs of roads. The best and the most valuable use, however, would be to fill up tanks and low-lying land with it. There are more than 3,000 tanks in Calcutta and the suburbs, most of which are a perennial source of danger to health; and, with a scarcity of material to fill them up, the supply from the incinerators would become exceedingly valuable, especially when the supply of earth from the docks and the Central Road is no longer available. At the suggestion of the Health Officer samples of incinerator residue were analysed. Experiments are also being made with it as manure in two tea gardens in Assam, and at the Government Botanical Garden, Dr. King having kindly promised to give his valuable aid and advice.

One of the chief purposes for which Dr. Simpson has been lately sent to Europe was that he might gather complete and trustworthy information on the subject of cremators suitable to the climate and condition of Calcutta. His report is anxiously awaited.

Work in the Amalgamated Area.

The Suburban Improvement Committee, consisting chiefly of the elected representatives of the amalgamated area, assisted the Chairmain in the supervision of that area.

It seems desirable to recapitulate in brief the chief measures taken for the improvement of the area during the year.

Underground drains were sanctioned for several roads.

In connexion with the new Bhowanipore Pumping Station, Rs. 3,38,236 have been sanctioned for laying water mains and services. Pipes have been laid down in the principal thoroughfares, the details of which will be found in the Engineer's Report. During the hot weather Rs. 7,000 were spent in supplying filtered water freely to the amalgamated area by carts. Rs. 2,52,000 were sanctioned for the construction or extension of roads. Rs. 10,285 and Rs. 16,584 were sanctioned for acquiring land in order to improve or extend Pitambur Sircar's Lane and Boisnubpara 1st Lane, respectively. Land is being acquired for the purpose, and the work will be taken in hand as soon as the acquisition is completed.

Drainage.

The drainage system, embracing 197·05 miles of sewers of the town proper, has practically been completed as to the pipes, though it still needs much attention to perfect it in other respects. The pumping power wants strengthening to make up the deficiency of natural fall, whilst extra appliances, and here and there changes, must be introduced to secure completer flushing and protect the soil from contamination. Advantage was taken of the presence in India last cold weather of the eminent expert, Mr. Baldwin Latham, to have the Calcutta sewers examined by him, and to obtain his opinion on a scheme for draining the 12·82 square miles of the "amalgamated area."

Estimates of the cost of the various parts of the project are :—

For the Town proper.—Flushing and sewer adjuncts (including valves to prevent back currents) and ventilation of sewers, Rs. 7,57,952, side surface channels, Rs. 1,72,315, and increased pumping power at Palmer's Bridge, 2,61,800.

For both Town proper and Amalgamated Area.—Reservoir of unfiltered water for flushing at junction of Russa Road and Lower Circular Road, Rs. 21,216. Improving existing outfall, including provision for outfall for sewage of amalgamated area, Rs. 13,81,978.

For Canal and fringe Areas.—Piping, lifting, sewerage and flushing, Rs. 19,73,505.

For Amalgamated Area.—Main arterial sewer for sewage only, Rs. 37,24,083, general sewerage, Rs. 71,80,000, and surface drainage for rainfall only, Rs. 15,96,078.

Thus the total of the estimates comes to Rs. 1,70,69,527. They have been but recently worked out by the Engineer. The whole matter remains to be examined by the Commissioners.

Sewer construction.—This was confined during the year to new and *bustee* roads. Nearly 2 miles of stone-ware pipes were thus laid, while 4½ miles of kirb and channel

stones were set up for surface drainage in various streets, 76 flushing chambers were constructed, and all cases of failure promptly attended to. 680 premises were connected with the sewers, and 6,736 house drains were examined, of which 46 per cent. were found defective.

Water supply.

The length of mains and services on the filtered system at the end of the year amounted to 231·45 miles (including 70·67 miles in the added area), of which 47·14 miles were laid during the year. The length on the unfiltered system amounts to 66·25 miles, of which 2·11 miles were laid during the year. The average supply per day of filtered water amounted to 17,182,383 gallons, and of unfiltered water to 3,507,095 gallons. This gives 39·46 gallons of filtered water per head per day for the town proper, and 15 gallons per head per day for the added area. The number of premises connected with the filtered water service mains in the town and added area combined is 19,850, of which 657 were served during the year.

Ten new urinals were set up and a new bathing platform constructed during the year. This brings the total number of urinals and bathing platforms to 83 (80 public and three private), and 108, respectively.

Bhowanipore Pumping Station.—The most important work connected with the water-supply was the commencement of the pumping station at Bhowanipore, designed to supply the southern district of the "added" area." The land was only made over to the Commissioners by the Land Acquisition Collector in the month of August 1890, and yet the covered reservoir to contain 3,000,000 gallons of water, the pump-well (the foundations of which are 24 feet below ground level), the engine-house, the boiler-house, the workshop and various subsidiary buildings had all been completed by the end of March 1891. The chimney shaft was also practically finished by that date, and the Superintendent's residence well advanced. The work thus rapidly executed is of first-rate quality, and has been carried through with scarcely a misadventure.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR 1890.

(*Dr. W. J. Simpson.*)

I have the honour to present the tables and statements relating to the vital and vaccination statistics of the town of Calcutta for the year 1890, including that portion of the suburbs which was in 1889 amalgamated with the town. Tables and statements relating to the meteorology and price of food are also submitted, and I have further the honour to submit reports on the work done during the year in the Analytical, Food Inspection, Medical Inspection, Nuisance, Conservancy, and Night-soil departments. I have also in a supplementary report given an account of the constitution of the Health Department as it now exists, after a gradual reorganization, which has taken over four years to accomplish. In this account the defects still existing are pointed out, which will in time, I hope, be remedied, but, on the whole, the Commissioners may be congratulated in now possessing an active Health Department more nearly approaching the standard of European cities. This fact will, doubtless, have reassuring effect on other sanitary authorities, who have for some years past been inclined to place Calcutta in quarantine. In a second supplementary report I have placed on record for future reference and for comparison an account of two important pilgrimages and their relation to the prevalence of cholera—one is in the endemic area of Bengal, the other in the non-endemic area of Northern India. The insanitary conditions existing at Kalighat are described in detail, with the object that radical measures shall be taken for their removal. I am glad to record that the Commissioners have already taken some steps in that direction; but I may add that among other improvements nothing short of removal of all huts and houses for at least 60 feet from the edge of the nullah will be of much use. Of course, all the ghats and temples would remain untouched as it is not they that do the harm. The sanitation of Kalighat is of the first importance, as it is a perfect hot-bed of cholera, and a focus for the spread of the disease elsewhere by means of the pilgrims who visit it throughout the year.

Vital statistics.

The number of births recorded during the year is higher than five of the preceding decennium. There were 7,948 births against 8,752 and 8,643 in the two preceding years. Calculated on the census population of 1891, the birth-rate was equal to 17·0 against 17·4 and 17·2 in 1880 and 1881, when the correct population was also known. During the past few years the birth-rate having been calculated on the census of 1881 has been somewhat over-estimated. The birth-rate in some of the wards is very low, for example, Waterloo Street ward, the business portion of the town in the European quarter, has a birth-rate only of 3·7 per 1,000 of the population, and Burrabazar and Jorabagan, the business quarters in the native town, have birth-rates of 6·4 and 9·2, respectively.

The number of deaths in 1890 was considerably higher than that in the preceding year. There were 12,382 deaths in 1890 against 11,682 in 1889, an excess in mortality of 700 deaths above that of the previous year. Much of the excess is on account of a large increase in fever, the mortality from which being 626 above the mean of the past 10 years. The report of Mr. Baldwin Latham on the drainage of Calcutta sufficiently explains the major causes at work inducing this unhealthiness. The epidemic of influenza at the beginning of the year, probably also by the lowering effect which it produced on the vitality of the residents, rendered the inhabitants more liable to the insanitary conditions existing in Calcutta. Another contributing cause was a smart epidemic of small-pox, causing 700 deaths, and which invaded Calcutta after having prevailed for some time previously in the surrounding districts.

Even, however, with the figures of this unfavourable year, the quinquennium just passed has with an increased population fewer deaths than the two preceding. This is shown in the following table :—

General Mortality from all Causes.

—	Quinquennial Period.	No. of Deaths.	Rates.
1871 Census	1866 to 1870	69,597	32·4
	1871 to 1875	56,610	26·3
1881 Census	1876 to 1880	67,789	31·2
	1881 to 1885	64,495	29·7
1891 Census	1886 to 1890	58,175	24·9

Calculated on the census of 1891, the death-rate of 1890 was equal to 26·5 per 1,000 of the population.

Fevers. The deaths from fevers are much in excess of previous year, the number being 4,154 against a decennial mean of 3,528. In previous reports the condition of the underground drainage and its effect on the Calcutta health has been dwelt on. I need not refer to the subject in this report, as Mr. Baldwin Latham has conclusively shown that the Calcutta sewers, when flooded, leak and pollute the soil of Calcutta and its sub-soil water, which conditions are known to be very important factors in the causation of disease, not only of fevers, but of a large number of those diseases included under the general heading of "Other Causes." The sooner, therefore, that the defects pointed out in the sewerage system are remedied, the more speedy will be the reduction in death-rate so far as it depends on this cause.

Other Causes. The deaths from other causes than those included under the distinctive heads of cholera, bowel complaints, fevers and small-pox amounted to 5,254 against a decennial mean of 5,339.

Cholera. The town has now enjoyed for two complete years a better distribution of the water-supply. The deaths from cholera in 1890 amounted to 963 against 1,079 in 1889. These figures show a marked reduction in the cholera rate compared with previous years, and there are only two years in the 21 years since the water-supply was introduced that have a smaller number of cholera deaths. This will be observed from the following table :—

Years.	Deaths.	Years.	Deaths.	Years.	Deaths.	Years.	Deaths.
1865	4,243	1872	1,102	1878	1,338	1884	2,272
1866	5,990	1873	1,105	1879	1,186	1885	1,603
1867	2,270	1874	1,245	1880	805	1886	1,741
1868	4,195	1875	1,674	1881	1,693	1887	1,198
1869	3,582	1876	1,851	1882	2,240	1888	1,734
1870	1,558	1877	1,418	1883	2,037	1889	1,079
1871	796						

In my report of 1889, remarking on the relation of the cholera rate to the water-supply, I observed that :—"This year has been a distinguished one in the Calcutta "Corporation, because of the bringing into operation the new pumping station at "Halliday Street, to remedy the scarcity of water felt in the riparian and other "wards of the town. Water is now obtainable from every stand-post for 12 hours "of the day, and there is abundant pressure where formerly it was insufficient. The "favourable effect on the cholera rate of several of the wards more immediately "concerned was soon marked, and has continued throughout the year, the death-"rate from cholera being much reduced this year in the riparian districts. Thus the "following wards, which benefited chiefly from the water-supply, show the subjoined "numbers of deaths from cholera in 1888 and 1889" :—

—	1888.	1889.
Coomertolly	170	80
Jorabagan	293	159
Burrabazar	76	48
Colootollah	251	142

Taking these same wards for 1890 we find the number of deaths from cholera as follows:—

—	1888.	1889.	1890.
Coomertolly - - -	170	80	63
Jorabagan - - -	293	159	113
Burrabazar - - -	76	48	44
Colootollah - - -	251	142	78

The table shows that the improvement on the introduction of the water-supply in 1889 has been more than well kept up in these wards, there being actually 131 deaths fewer than last year. But this greater improvement should make one very careful in extending the water-supply to the suburbs at the expense of the town supply. There have been indications that until the new suburban works are in operation, this extension has been carried as far as safety will allow. During the year a number of new stand-posts have been erected in the town, which gives a better water distribution, but this is yet very far from being what it should be. Even if there were double the number of existing stand-posts, there would be none too many for the requirements of the inhabitants.

The most notable feature in the cholera mortality of the year was an outbreak in the first quarter, which seemed to be attributable to emanations from drains infected with cholera dejecta.

Influenza.

During the year Calcutta was invaded with influenza. Early in February, a few cases began to appear among the merchants and their employés in Burrabazar and Jorabagan, and it was not long before many of the large and crowded houses in these districts had more than 50 per cent. of their inmates affected. In some cases, so many of the employés were attacked that business was suspended for several days. The disease was clearly imported from Bombay, and was brought to Calcutta by those merchants who have places of business in both towns, and who are constantly passing backwards and forwards between the two cities. From the business quarters of Calcutta it was soon taken to the residential portions, where having once established itself, it soon got into the schools and European offices. These again helped to spread it more quickly than ever and in every direction, so that about six weeks after the introduction of the disease into the city, it had become widespread. Workshops, offices, shops, banks, and places of business had in turn within a very short time a large percentage of absentees. Artizans, labourers, clerks, soldiers, police, and prisoners suffered more or less, no class of the community being particularly exempt. The only noticeable exception was that fewer escaped in the crowded parts of Calcutta than in those less crowded. Happily for the inhabitants, the epidemic did not reach Calcutta before the commencement of the hot weather. Had its arrival taken place in the cold weather, the same casualties would probably have occurred as have been reported to have rendered influenza so fatal in some of the European countries. As it is, few deaths happened in Calcutta from influenza in comparison with the number recorded in other towns, and, on the whole, the city was fortunate in escaping with a mild type of the disease. Severe relapses were not uncommon in the native portion of the town. The epidemic, however, very materially helped in lowering the state of public health, and rendered many of the inhabitants less able to withstand the effects of the insanitary conditions which surround them. There was a recrudescence of the disease in January and February of 1891, and probably owing to the colder weather, the malady was much more severe in its character. This second appearance of the disease could not be traced to importation, and seemed to be a revival of the former epidemic.

Small-pox.

Small-pox prevails in Calcutta every fourth or fifth year, and continues more or less for two years. The last epidemic commenced in the beginning of 1889, and although kept under control, it lingered through the rains and re-appeared in an aggravated form in November following. From December it began to increase. In January and February 1890 it became prevalent all over the town and amalgamated portion, and in March the epidemic reached its height. From April it began to decline, and abated altogether in August. The epidemic was of a severe type, and attacked many persons previously protected by vaccination and inoculation as well as those previously protected by a former attack of natural small-pox. An account of the prevalence of this epidemic in the different wards of the town and amalgamated

area, and of the measures adopted to stamp it out, has been furnished in a former report, and it is not necessary to repeat what was then said. From September to December Calcutta was entirely free from small-pox, if we leave out of consideration the following three cases in which the disease was imported from outside. The first case was reported in October from the Campbell Hospital. The man resided beyond the limits of the suburbs, and was not a resident of the town. The second case was a clerk in the Judicial Branch of the Home Department of the Government of India. He came from Simla in the beginning of November, while the disease was incubating in him, and got ill with confluent small-pox a week after arrival. He died at his residence, 47-1 Bachoo Chatterjee's Street, Ward No. 4, Sukea's Street. He was inoculated in his infancy. On this case coming to the notice of the Deputy Superintendent, his whole family were re-vaccinated, and the usual precautions, as regards the destruction of his beddings and clothings and the disinfection of his house, were taken. The third case was a European in the service of His Highness the Maharajah of Cooch Behar. He too came from Simla towards the close of November, and got ill immediately after arrival. He was removed to the small-pox hospital at Sealdah, and the whole household of the Woodland's Palace at Alipore, including His Highness and family, were re-vaccinated. It was a mild discrete variety of the disease, and the man rapidly recovered. He was vaccinated in his infancy in England. The sanitary precautions in the Palace were carried out by His Highness' medical attendant in consultation with the Deputy Superintendent.

On the 24th of November S.S. "Soultan" arrived in port with a case of small-pox of 20 days' standing. The man was removed to hospital, and the rest of the crew re-vaccinated.

The largest number of deaths occurred in the Jorabagan Section, which is chiefly inhabited by up-country people. There were 88 deaths in the Burrabazar Ward, chiefly among up-country people.

Vaccination. The total number vaccinated during the year 1890 amounted to 27,174, of these 16,131 were primary, and 11,043 were re-vaccinations. The corresponding figures of the previous year were 14,312 and 3,666 respectively. This shows an increase of 1,819 primary and 7,377 re-vaccinations. This increase was due to the prevalence of small-pox during the first five months of the year, when children up to a very tender age were vaccinated, and large numbers were also re-vaccinated.

Of the primary vaccinations, viz., 16,131, 14,207 were successful, 711 unsuccessful, and in 1,213 cases the result was not ascertained. The rate of success calculated on the ascertained successful cases was 88·0. Of the 11,043 re-vaccinations, 2,252 were successful, 5,038 were unsuccessful, and in 3,753 cases the result was not ascertained. The rate of success in re-vaccinations was 20·39. The rates of successful cases last year were 88·12 and 18·09, respectively. Of the total vaccinations performed during the year 15,983 were males and 11,191 were females: 1,716 were Christians, 19,851 were Hindoos, 5,269 were Mahomedans, 338 were other castes; 7,728 were under one year, 7,057 above one year and under six years, and 12,389 were above six years.

In Calcutta both the humanized and animal virus was kept up by regular transmission and used all the year round. There has been progressive improvement in the rate of success from the animal virus, and it is in great demand. All the public vaccine stations in the town and amalgamated area were supplied with vaccinated calves throughout the year, and almost all home vaccinations were performed with animal virus at the special request of the people. The animal virus, therefore, was a source of great convenience to the department, and enabled the vaccinators in many cases to do away with the practice of taking lymph from the arms of children. Humanized lymph was also used in a large number of cases of vaccination.

Vaccination is carried on in Calcutta under the previsions of the Compulsory Vaccination Act. The registrars of births issue notices to parents or guardians of children at the time of registration to have them vaccinated within one year. When a child is successfully vaccinated, a certificate to that effect is given to its parents, and the duplicate of it is sent to the registrars, who make an entry in their birth register under column "Vaccination," that the child is vaccinated. The registrars submit to the Health Officer monthly statements of persons, the successful vaccination certificate of whose children they do not receive within one year. Last year they submitted by such monthly statements the names of 9,014 persons who failed to produce the statutory certificates of having had their children vaccinated. All these cases were inquired into by the department with the following results:—6,013 traced and vaccinated, 1,237 were found to have left town or changed abodes, 448 were not

found, 591 had died, 495 were ill, 29 had small-pox, and 201 were prosecuted and vaccinated by order of magistrates.

Under the powers conferred on the vaccinators by the amended Act, house-to-house inquiry for unprotected children was daily made by the male and female vaccinators in the town and amalgamated area, and where children over one year were found, notices were issued by the department direct to parents or guardians to have them vaccinated within 15 days. In this way nearly 3,000 notices were issued during the year 1890. Most of these people got their children vaccinated on receipt of the notice, but 266 had to be prosecuted. In certain localities and among certain classes, as the up-country Marwarries of Burrabazar and Jorabagan, great difficulty is experienced in obtaining the names of parents, and hence they could not be easily dealt with by law. During the prevalence of the epidemic in the beginning of the year under report, the Deputy Superintendent was able to introduce vaccination for the first time into several Marwarry houses, and it is hoped that their prejudice against vaccination will gradually die away.

Vaccination is systematically carried on in all sections of the town and amalgamated area, but the degree of protection in each ward varies with the nature of its population. The wards inhabited by Europeans and resident Bengalees are better protected than those inhabited by up-country people. The Vaccination Act enables the vaccinators to push on vaccination amongst the lower classes of up-country men, but the upper classes are very difficult to deal with and vaccination is making very slow progress amongst them. As stated elsewhere, under the pressure of the epidemic, the Deputy Superintendent was able to introduce vaccination for the first time in several Marwarry and Khettri houses last year.

Vital Statistics of the Amalgamated Area.

The ratios are estimated on the first figures furnished to the Health Department of the census of 1891. From the following table the increase in population in the different wards will be seen, and it will be noted that in several the increase is so considerable as to show that the death-rates published for the suburbs during the past few years have been over-estimated.

Population of the Suburban Area in 1881 *and* 1891.

Ward No.	—	1881.			1891.		
		Male.	Female.	Total.	Male.	Female.	Total.
	Added area of Shampooker	2,858	2,502	5,360	4,338	2,596	6,934
	Do. Burtollah	2,625	2,423	5,048	4,596	3,461	8,057
	Do. Sukea's Street	4,959	3,507	8,466	5,365	3,713	9,078
	Do. Moochiparrah	1,880	1,286	3,166	7,287	3,076	10,363
19	Entally	46,065	10,864	26,929	20,043	13,104	33,147
20	Baniapooker	10,792	8,103	18,895	13,621	9,399	23,020
21	Ballygunge and Tallygunge	8,276	6,223	14,499	13,018	9,813	22,831
22	Bhowanipore	21,035	16,967	38,002	24,232	18,359	42,591
23	Alipore	9,012	4,426	13,438	9,854	4,950	14,804
24	Khidderpore and Ekbalpore	8,117	7,752	15,869	8,297	7,043	15,340
25	Watgunge and Garden Reach	10,771	7,573	18,344	17,356	9,477	26,833
	Total	96,390	71,626	168,016	128,007	84,991	212,998
	Canal	—	—	—	2,072	30	2,102
	Grand total	96,390	71,626	168,016	130,079	85,021	215,100

There were 3,970 births in 1890, giving a birth-rate of 18·4 against 3,565 in 1889, equal to a birth-rate of 16·5.

There were 7,986 deaths registered in 1890, which is estimated to be equal to a death-rate of 37·0 per 1,000 of the population against 7,882 in 1889. Khidderpore and Alipore presented the highest death-rate, both being over the annual rate of 41 per 1,000; Khidderpore had the highest fever-rate attributable to the excavation of the docks and the obstructed drainage which has followed.

The number of deaths from the principal causes during the past two years were—

—	1890.	1889.
Bowel complaints -	1,448	1,425
Cholera - -	916	1,236
Small-pox - -	172	28
Fevers - -	2,638	2,653
Other causes - -	2,812	2,540

The uselessness from a sanitary point of view of the laws and byelaws for streets and buildings in Calcutta becomes more apparent the longer they are in force. I wrote very fully on the subject in my last Annual Report. I have little to add to that report excepting to record that longer experience in the working of the laws brings out the fact that, in different parts of the town, unhealthy houses are being built according in every respect with the requirements of the existing laws. The laws and byelaws now in force might very appropriately be termed laws and byelaws to legalise insanitary buildings.

Organisation of the Calcutta Health Department.

In an Indian municipality such as Calcutta, where the executive and governing body are liable to more rapid changes than in English towns, it is very important for continuity of action that a record should be kept of an organisation which has been effected within the past five years for the carrying out of the health laws of the town. This is all the more necessary here for there is a periodical tendency to make retrenchments in the Health Department to the detriment of the public health, and it is, therefore, with the object of placing before the Commissioners and the Government for future reference a succinct account of the present organisation and working of the Health Department of Calcutta that this is written.

In introducing the subject, I may mention that, though the changes caused a great deal of controversy at the time of their initiation, they were carried through and approved of by the Commissioners themselves.

It is unnecessary for me to more than briefly allude to the condition of matters on my arrival in Calcutta. They are recorded in the Report of 1885 of the Commission appointed under section 28 of Act IV. (B. C.) of 1876 to inquire into certain matters connected with the sanitation of Calcutta, more especially as regards the *cleaning* and *conservancy* of the town. Certain changes were then suggested, which included an increase in the number of inspectors and an increase in the various establishments relating to cleaning and conservancy. The organisation, however, of the Health Department, which is something more than a mere cleaning and conservancy department, was not touched upon.

There was practically no Nuisance Department to see that the laws relating to the abatement of nuisances be carried out. There was a night-soil removal establishment to cleanse privies, and a few inspectors to supervise the work, and this had been erroneously named the Nuisance Department, though having little in common with the duties which belong to sanitary inspectors or inspectors of nuisances in large cities. A Nuisance Department is that department which attends to complaints of the public regarding nuisances which may come under the health sections of the Municipal Act relating to condition of privies, cesspools, stables, cowsheds, drainage, keeping of animals, or any accumulation or deposit of offensive matter, unwholesome tanks, wells, offensive trades, overcrowding, or other matters likely to be injurious to health. But besides attending to complaints, it is the duty of the department, through its inspectors, to search for nuisances which arise under these headings, and have them abated under the Act, and it is also the duty of this department not to permit any new structure or business to be licensed unless it conforms to the health laws and byelaws of the Act. It will thus be seen that the Nuisance Department is a very important one, and, if properly equipped, should have at least one nuisance inspector for each ward of the town. This is the case in large English towns where the nuisance or sanitary inspector is a person quite distinct from the supervisors of conservancy or of removal of night-soil.

There was no systematic medical inspection of houses in the case of zymotic disease breaking out, nor inquiry into the probable cause of the outbreak nor disinfection and cleansing of the premises to check the spread of the disease.

The cleaning and conservancy of the town was partly performed by establishments under the Engineer and partly by establishment under the Health Officer. The sweeping of the streets, cleansing of gully-pits, removal of refuse, road scrapings, and horse-dung by carts was under the Engineer, while the cleansing of bustees and of privies and cowsheds, and the removal of the refuse, night-soil, and cow-dung was under the Health Officer. The control, management, and feeding of the horses and cattle, and the maintenance of the cattle sheds were under the Engineer, while the control of latrines and public cowsheds was under the Health Officer. The filling of tanks with refuse and the elaborate procedures connected with it, were also under the Engineer. The analysis of gas and water was under an independent analyst. There was at the time no Adulteration Act, so that food stuffs were not analysed.

Part of the registration of births and deaths was carried out by the police and part by the Health Officer, and the Bustee Constructive Department was under the management of the Chairman.

The want of a properly constituted Health Department was at once apparent, and in a note on the subject early in 1887, the defects were pointed out and a scheme of re-organisation was placed before Sir Henry Harrison, who had long before been convinced that a thorough re-organisation was necessary.

In the scheme the essential points kept in view were—

(*a.*) Consolidation of the duties and centralisation.

(*b.*) Creation of the necessary departments combined with strict economy.

A clear notion of the requirements of a Health Department in India had to be kept steadily in view. The only point of obscurity was whether the whole of the cleansing and conservancy and removal of night-soil should be worked and controlled by the Engineer as in English towns, where the Health Officer does not undertake these duties, or whether all should be placed under the control of the Health Officer. The latter course under the circumstances of Indian hygiene was thought advisable. This decision, however, had the effect of causing some of the Commissioners to believe that the organisation of the Health Department was thereby completed, whereas it had to be strenuously pointed out that the organisation had not yet begun and was unaffected by this decision, for in European cities the large Health Departments under the control of the Health Officer had none of these duties, but well and defined duties apart from these, in fact that a Health Department had still to be formed in Calcutta. This requires to be well borne in mind, for should the whole of the cleansing and conservancy be ever taken from the Health Officer, he would still require a nuisance inspector in each ward and a good-sized health establishment. The only part of a Health Department which existed in the European sense of the term, was an out-door establishment to look after vaccination and an in-door establshment to compile the vital statistics, and one food inspector had been recently appointed. Establishments for the systematic inspection and abatement of nuisances, also for the inquiry into and adoption of measures to check the spread of disease, had to be added; the registration of births and deaths and their compilation as well as food inspection had to be re-organised, and the analysis of water, gas, and food arranged for.

The scheme proposed was to make each ward of the town a sanitary district, in which there should be a ward inspector, vaccinator, and registrar responsible for the sanitation, vaccination, and registration in that district which for a proper attention to details required not to be too large in area. The recommendations in my note were as follows:—

The plan for working the Health Department with its distinct scavenging and sanitary sub-departments as already described is to place the health administration of the town on much the same basis as the police administration. The town for police registration purposes is divided into 18 wards. I would divide the town for health purpose into 18 districts, which for convenience might correspond to the present police wards. The size of each district should be small, to enable it to be efficiently supervised, and to allow the staff to obtain a thorough knowledge of its sanitary requirements; a desirable feature in small districts is that neglected work is easily discovered and fixed on the responsible party. Having divided the town into sanitary districts—

(*a.*) Each district should have an inspector, vaccinator, and registrar.

(*b.*) A certain number of sanitary districts grouped together would form a sanitary division, to which should be attached one medical inspector. It is proposed to constitute five such divisions.

(*c.*) The staff of the district and divisions would be under the control of the central office.

Amongst other advantages this arrangement provides for the system being extended when the suburbs are included in the town administration. With such a system, the staff will be as follows :—

SANITARY.

1 Superintendent of Nuisance.	1 Deputy Superintendent of Vaccination with Assistants.
5 Medical Inspectors.	2 Food Inspectors.
18 Sub-inspectors.	2 Assistant Analysts.
18 Registrars.	
18 Vaccinators.	

The proposed scavenging districts will correspond with those of the Sanitary Department, a sub-overseer or foreman scavenger will be made responsible for the condition of each district, and the whole will work under the supervision of the superintendent and his assistant, as follows :—

SCAVENGING.

1 Superintendent.	With their necessary staff of subordinates working establishment.
1 Assistant Superintendent.	
18 Sub-overseers.	

If, however, it is considered more desirable to merge the Scavenging and Sanitary Departments into one, and not to work them separately, then the supervising agency should be :—

Alternative Scheme.

1 Superintendent.	18 Registrars.
2 Assistant Superintendents.	1 Deputy Superintendent of Vaccination with staff of Vaccinators.
5 Divisional Inspectors.	2 Food Inspectors.
5 Medical Inspectors.	2 Assistant Analysts.
18 Inspectors or Overseers.	

The alternative scheme was, in the main, accepted. Two Superintendents, one for the north and one for the south, were granted in place of one superintendent and two Assistant Superintendents. The five divisional inspectors were not entertained, nor at first were the medical inspectors. Afterwards the latter were allowed, and other changes have been gradually introduced, so that the department at present consists of 2 Superintendents, 17 Ward Inspectors, 17 Sub-registrars, 5 medical Inspectors, 1 Deputy Superintendent with staff of vaccinators, 2 Food Inspectors, and 1 Analyst. An Assistant Health Officer was appointed also in place of the former Personal Assistant to the Health Officer.

The town is divided into two districts, each with a superintendent. Each ward has an overseer whose duty is to muster and supervise the daily work of the coolies, carters, and sweepers engaged in the cleansing and conservancy of the streets and bustees in his ward, 2ndly, to supervise the work of the mehters in the cleaning of the privies, 3rdly, to act as registrar of births and deaths in his ward, and 4thly, to act as nuisance inspector for the ward. The duties are onerous and multifarious and often too much for one man, and it is for this reason I should have liked the divisional inspectors to have been entertained, whose duty would have been to have looked after the proper working of the cleaning and night-soil establishments, and thus left the ward inspectors free to attend to nuisance work, which entails attendance at Court. If the Divisional Inspectors' suggestion be not ultimately adopted, I think it absolutely essential that the present ward inspectors should be given horse allowance, so that they may get about their ward more easily, and thereby save time.

The Inspector is responsible that the men allotted to him sweep the streets and lanes and cleanse the surface drains, also cleanse out the gully-pits; remove the street sweepings, gully-pit silt, and the refuse thrown out by the inhabitants into the streets, and properly convey the material to the refuse platforms in Circular Road, and then discharge it into the waggons. He is also responsible for the removal of all road scrapings which, with macadamised roads, is a very heavy undertaking in the rainy weather; he removes the cowdung from the numerous cowsheds in his ward, also the stable litter from stables, and during the day the horse droppings in the streets. In addition to this he is responsible for the proper cleaning of the bustees, large and small, in his ward, of their gully-pits and surface drains and the removal of the bustee refuse to the platforms. Then he is responsible that the mehters under him remove daily the night-soil from all the privies in his ward.

After this, whatever time he may have, which can be very little, he devotes to seeing if the Sub-registrar, who is also his clerk, to keep his muster book, &c., is doing his work properly, and he begins his work of Nuisance Inspector, serves notices under the Act, reports on nuisances, and has to attend Court several times a week, in cases of prosecution. Added to these duties in wards where there are tanks, any of which have been ordered to be filled up, he makes the necessary arrangements and supplies

the supervision. Besides these, there are many other miscellaneous duties he has to perform.

In connexion with the conservancy of Calcutta, there is one important point I wish to record, viz., the impossibility of decently cleaning the north part of the town with the present regulations. The inhabitants are permitted to throw refuse into the streets until 8 in the morning, and with this rule the streets are not cleansed until 11 and sometimes after 11 o'clock in the morning. Permission is given by the rules to throw out refuse again at 12 o'clock, so that as soon as the streets are cleansed they are again soiled, and this refuse remains until the next morning. The consequence is that the streets are never clean; the soil is never free of filth; it gets thoroughly saturated and gives off offensive smells. I know of no other town in India where the inhabitants are permitted the same license. Benares, Agra, Delhi, and Lucknow are cleaner in this respect than Calcutta.

Medical Inspection.—For inquiry into disease five medical men are entertained. Every case of infectious disease, small-pox, diphtheria, enteric fever, tetanus, cholera, and other dangerous diseases which come to the knowledge of the Health Department is visited by them, inquiries made, and the house inspected and reported on. If sanitary defects are found steps are taken to remedy them, and the house is afterwards thoroughly disinfected. In times of exceptional aggravation of cholera, cases of diarrhœa, bowel complaints, and cholera among the very poor are visited and treated by the medical men. They also check the births and deaths registered in their division.

The information relating to zymotic diseases is obtained from the death registers, from the hospitals, the ward inspectors, and from postcards received from medical men. These postcards, which were introduced lately, are not made use of as frequently by the medical men as might be, but as it is a new mode of notification, some time must elapse before much can be expected.

In this manner the Health Department knows exactly what is going on, is acquainted with the distribution of disease in the city, and is enabled to take the necessary measures to check its progress.

Food Inspection.—Two inspectors are engaged for the inspection of the fish supply and other articles of food of a decomposable nature brought to town by the Sealdah railway line; also for the inspection of food and grain and milk brought in by native boats; for the inspection of shops and markets and the seizure of unwholesome food, also for buying samples of food or drink which they may suspect to be adulterated, bringing these samples to the laboratory, and on receipt of the Analyst's report arranging for prosecution of the parties if the sample proves to be adulterated.

As regards adulterated food, a counterfoil book is kept by the food inspector, and when a sample is taken, the following label is attached and sealed to the sample with particulars and the inspector's signature. When the sample is handed over to the Analyst, the latter attaches his signature and date on which it was received.

No.
Date of taking sample
Name of the proprietor
Name of the seller
Name and No. of Street

Signature of Inspector.

Date on which sample received by Analyst 189 .

Signature of Analyst.

Laboratory Work.—One Analyst is engaged who performs the following duties pertaining to analysis:—

The regular examination of the Calcutta public water-supply at its various stages of purification and on its delivery in Calcutta; the regular examination of the Calcutta gas as to illuminating power and as to freedom from certain impurities likely to occur in coal gas, not properly purified before its distribution; examination of tank waters and reporting on the result of analyses; examination of samples of ghee, drink, food or other substance which may be sent to the laboratory for analyses or examination; and the attendance at Court to give evidence if required in cases of prosecution under the Adulteration Act.

Formerly, Mr. Pedler, of the Presidency College, used to analyse the gas and water for the municipality, but now I am glad to say the Commissioners have their own laboratory, properly equipped and attached to the same building as the Central Health Office. Through the kindness of Dr. Warden, Chemical Examiner for the Government, and the permission of the Government, two young medical men have been thoroughly

trained, not only in water and gas analyses, but also in general analyses, and that of food stuffs. Only one is engaged in the laboratory at present, but I hope soon to see both of them working there, because the work to be properly done in the laboratory requires the attention of two trained men. This necessity has already been pointed out.

Vaccination.—Very slight change has been made in the vaccination arrangements which were first organised by the Government and then handed over to the municipality. The establishment consists of a Deputy Superintendent of Vaccination, an assistant and a staff of vaccinators. There are seven public vaccination stations in the town at which vaccination is carried on free of charge. Home vaccination is also provided for at a small charge.

The ward registrars of births and deaths are instructed to issue notices on parents at the time of registration of birth to get their children vaccinated within one year. In these notices the situation of the public vaccine station nearest to their homes is given, the working days and hours are given as well as the different forms of certificates which the people are to obtain from the vaccinators and to keep in their possession. When a child is successfully vaccinated a certificate to that effect is given to its parents, and its duplicate is sent to the registrar of the ward where the child was born. On receipt of the certificate the registrars make an entry in the birth register under the column "Vaccination" that the child has been successfully vaccinated. The registrars submit to the Health Officer monthly statements of the names of persons the successful vaccination certificate of whose children they do not receive after the completion of 12 months. These cases are inquired into by the department and mostly traced and vaccinated. Those who refuse to comply with the law are prosecuted.

The above procedure is simple enough for children born in Calcutta, but to deal with unprotected children and adults who arrive to reside in Calcutta, regular systematic house-to-house inquiry for unprotected children and adults, both by the female and male vaccinators, is needed, and forms an important part of the duty of the department.

Registration of Births and Deaths and Compilation of Vital Statistics.—As previously mentioned, the registration of births and deaths was partly in the hands of the police and partly in the hands of the Health Officer. This has now been changed, and the whole is under the control of the Health Officer. There are sub-registrars at each of the burning ghats and burial grounds with a visiting inspector; there is a sub-registrar also in each ward for ward registration, and the registers are examined periodically. The deaths are forwarded to the Health Office where, in the Registration Department, they are recorded and compiled, and the weekly, monthly, quarterly, and yearly vital statistics are prepared. A record of all registered births and deaths which have occurred in the town and amalgamated area are kept in the Central Health Office, and are available for public purposes. On the payment of a fee the books are searched, by the clerk in charge, for births or deaths that may be required, and certificates or copies of these entries are granted by the Health Officer on request.

In English towns this same work is performed by two different authorities unconnected with the municipality, and a copy of the births and deaths are sent completed to the Health Department where they are only complied for statistical use. The consolidation, however, of all the duties under the municipality, as in Calcutta, is much cheaper, and, on the whole, more satisfactory if worked properly, but greater expense needs at present to be incurred in the safe keeping of these valuable records, and it would be better if the ward registration of deaths was compulsory instead of being voluntary as at present. The ward registration of births is compulsory.

There are many other miscellaneous duties which cannot well be classified. But the general outline of the constitution of the Health Department has been here given. It is not quite up to its proper standard, but probably this will come in time. Once that standard is attained, the Commissioners may remain assured that no large increases will be necessary. The Health Department is not the spending department. There is an impression among some of the Commissioners that the Health Department under the Health Officer is a costly and large spending department. This is not so. Most of the work, with the exception of conservancy, bustee cleansing, and night-soil removal, which in other large towns is not directly under the Health Officer, but needs to be in a town like Calcutta, is inspectorial and medical work. To compel private individuals to abate the nuisances they have created; to compel private individuals to take care not to endanger the public health from epidemic or endemic diseases from

which they may be suffering; to keep a watch on conditions which are continually arising in towns through ignorance and selfishness, and which will injure the general health, and to look after the purity of the food, water, air, and soil of the city, are the chief duties of the Health Department, and this involves for its accomplishment the maintenance of a well-trained staff.

Unity and interdependence of each of the departments will be seen to have been aimed at. The Vaccination Department is somewhat dependent on the registration and the registration on the vaccination. The medical inspection holds a similar position, and the laboratory is worked in conjunction with the food inspection. The Nuisance Department is connected somewhat with the registration and also with the Conservancy and Night-soil Department, though for the proper working of this latter department, I would like to see the appointment of the divisional inspectors who were first recommended.

There is one word of caution which I wish to emphasise. There is a tendency which always needs to be combatted, for it can only lead to confusion, inefficiency, and non-accomplishment of the work in view. It is that of adding work gradually without providing any adequate agency to carry it out. A new Act is passed enforcing the sending in of plans to the municipality for sanction before building. No adequate agency is appointed for the new work. The Engineer, with his already over-burdened staff, is supposed to see that the Act is carried out. Projects of new hospitals and dispensaries are discussed and determined on, and the supervision is thrown, as a matter of course, on the health officer. A project of filling up tanks systematically in the suburbs is suggested by the Health Officer. The scheme is agreed to, but the work is given to the Health Officer without money or staff. It is the work of an engineer, and needs money, waggons, railways, coolies, and supervising agencies. The tank filling in the suburbs is as important, or perhaps more important, than any drainage scheme for that area; but it will not, and cannot be done, without a special agency to carry out the work. These are defects in the general organisation which will, no doubt, in time be remedied; but in the meantime they are worth recording.

And now as regards expense. As explained, the cost of scavenging of the streets and the conservancy of bustees and the cleansing of privies and removal of the night-soil, must be kept separate from the cost of nuisance inspection, medical inspection, food inspection, analytical work, vaccination, and registration. To take the former work from the engineer and hand it over to the Health Officer does not prove that the Health Department is an expensive one. The cleansing of a city, and such a dirty one, as Calcutta, must always be costly. The cost of the conservancy working establishment is less now by Rs. 420 than the amount budgetted for by the engineer before the establishment was handed over to the Health Officer. The night-soil removal establishment is less costly than before; in fact, it is more than a self-supporting establishment; the receipts in 1887 exceeding the outlay by Rs. 50,000. The new Municipal Act has, however, merged this income into a general sewer-rate, which, when the money is spent on construction of sewers and drains, causes the night-soil removal establishment to appear to be no longer self-supporting, but a costly establishment. It is like depriving a man of his income, and a fortune besides, and then wondering why he needs money. The only additional expense incurred in conservancy establishment is in the daily cleaning and conservancy of bustees, which is a new feature within the last four years, and is provided for in the Municipal Act by the levying of a special rate on bustee-owners.

The tank filling operations have also been transferred to the Health Department and the expenses have likewise been transferred; and recently, on account of the burning of refuse having been advocated by the Health Officer, the working of the incinerator, with its expenses, have been thrown on to the Health Department. These matters are mentioned in detail, for they are all costly items, and explain the apparent increase in the costliness of the Health Department, which is more apparent than real.

With such large working establishments, there must necessarily be a fairly sized clerical staff to check the attendance rolls, make out bills, and see after the payment of these establishments. There is a Bill Department, costing Rs. 1,000, to prepare bills for payment of out-door and in-door establishments, receive and classify miscellaneous bills for stores, hired carts and cattle, and for work executed by contractors in default of compliance of notices served by the Nuisance Department, to prepare recoverable bills, and make out indents for stores applied for by Conservancy and

Night-soil Departments. There is also a General Department, costing a little over Rs. 6,000 annually, to carry on the general clerical work relating to conservancy, cleansing of bustees, night-soil removal, tank filling, and nuisances, as well as work of a miscellaneous nature. These clerks keep the records of all applications connected with the departments, receive, docket, and register all letters, copy replies, make out sanctions, receive diaries and papers from inspectors and ward offices, issue reminders on notices served, write notices, issue licenses for dangerous trades and markets, register papers and correspondence regarding tanks and wells, and keep a record of prosecutions, with their results To do all this work there is one more clerk than formerly; but for efficient working, more are needed.

With this explanation, I shall proceed to give the cost of the other departments under the Health Officer:—

	Yearly Rs.	
Ward overseers for nuisance inspection	26,310*	Income 42,000.
Food inspection	3,768	
Medical inspection	9,868	
Analytical work	4,051	
Registration and compiling of vital statistics	9,847	
Vaccination	10,852	
Slaughter-house	7,879	

* These inspectors, however, have other duties relating to conservancy and night-soil removal which have been described, and which I should like to see performed by five additional divisional inspectors.

The foregoing arrangement relating to the Health Department of the town proper was completed before the amalgamation of the suburban area, with its 250,000 inhabitants, took place. At the time of the amalgamation, in April 1889, a health organisation had accordingly to be provided for the suburbs, which should approximate, as far as circumstances would permit, to the organisation in the town; the area of the suburbs taken over is twice as large as the town, but much more sparsely populated. A similar division into sanitary districts was effected, but as the seven wards were larger in area than the town, an Assistant Ward Inspector was given to the Ward Inspector. A Superintendent and Assistant Superintendent were appointed, and two Food Inspectors engaged. The Vaccination Department was taken over from the Government, and the Deputy Superintendent of the town put in charge of the whole. Occasionally, medical inspectors have been employed, but not permanently. I trust, however, that their appointment will be made permanent, as their services are much required. The whole was placed in charge of the Health Officer of the town.

Nuisance inspection, food inspection, registration, and vaccination are carried on in a similar manner as that described for the town. The laboratory work at the Central Office is done also for the suburbs, and all the clerical work has been transferred to the Central Office.

Pilgrims and Cholera.

As the rôle which pilgrims play in the production and diffusion of cholera is an important matter of public health, deserving the attention of the municipality as well as of the Government, I propose in this supplement to place on record, and in juxtaposition, an account of two large pilgrimages, one in the endemic area of Bengal, the other in the non-endemic area or northern part of India, both of which took place in the early part of 1891. It is not the first time my attention has been specially drawn to the close relationship which cholera outbreaks often bear to the gathering of large crowds and of the diffusion or divergence of the disease from a central focus on dispersion of the gathering. In this connexion, my first experience was gained in Egypt when inquiring into the causes of the outbreak of cholera at Damietta, where, after a fair attended by 15,000 people, cholera broke out and spread over Egypt. Investigations on the spot left a strong impression on my mind that the fair had probably been attended by pilgrims on their return from Mecca, at which place cholera prevailed somewhat earlier in an epidemic form. Importation having once introduced the disease into Damietta, the local epidemic was caused by the use of contaminated water obtained from the Nile, the basin of the river in front of the town having become so low that it was almost stagnant at the time of the fair. This water was used, as in

India, for all purposes, and the epidemic just lasted as long as the water remained in that stagnant and contaminated condition. As soon as the waters of the Nile rose and swept out this polluted basin, the cholera disappeared from Damietta, having, however, been carried in the meantime by fugitives to other parts of Egypt.

My next observation has been in Calcutta, where every June and July brings a number of returned pilgrims from Pooree after the Rathjatra or car festival and Punarjatra or return of the car festival. Always some of the Pooree pilgrims arrive in Calcutta infected with the disease, and often the inmates of the houses in which the pilgrims have taken up their temporary residence are afterwards attacked with cholera. My interest in these matters was further aroused while in Ceylon by an outbreak of cholera, which had occurred at Pallecudava, on the occasion of a Roman Catholic pilgrimage to the Church of St. Anna, and which was attended by pilgrims from the northern province of Ceylon and from Southern India, where cholera was prevalent at the time. Pilgrims began to flock in on the 18th of July, and by the 24th, 5,000 had arrived at the place of pilgrimage, and many were still travelling on the roads to St. Anna to be present on the special day dedicated to the Saint. Cholera, however, broke out on the 24th of July among the pilgrims gathered at St. Anna, seven cases, with three deaths, occurring on the first day. The Roman Catholic authorities, having held the festival against the advice of the Government, now did all in their power to prevent further mischief; the congregation was ordered to disperse, and constables and a priest were sent along the roads to turn back the hundreds of pilgrims still on their way to the shrine. Precautions were taken by the Government for the inspection and retention of affected pilgrims along the roads, and the preventing of any pilgrims lingering in the vicinity of towns. Even with this prompt action 30 deaths from cholera were soon reported.

The outbursts of cholera at Mecca are well known. This holy place is the central converging point of the Moslem religious world, and pilgrims go there from Asia and Africa, and the diseases which some may take with them have in this large gathering a splendid opportunity of development and diffusion. Only last year the whole of Europe was placed in a state of alarm owing to the presence of cholera at Mecca, Jedda, and other places in the Hedjaz, and a great deal of vigorous quarantine was kept up. This alarm is a periodical one, and those who have read Dr. Christie's narrative of cholera epidemics in Africa will know the circumstances under which the large gathering at Mecca meets, and the pollution to which the holy well of Zem-Zem in the temple is subjected, and will be acquainted with the instructive and interesting account there given of the relationship which these gatherings bear to African epidemics of cholera.

In India itself there are the records of outbreaks during the pilgrimages at Conjeveram, Triputti, and other sacred places in the Madras Presidency, where it has been officially recorded that in that Presidency the intensity of cholera and the prolongation of its epidemic visitations are largely due to the habit of the people in gadding about to divers places where festivals are held, and by their unnatural modes of living during such seasons of festivity. The great Hurdwar fairs in Northern India of 1867 and 1879, with their outbreaks of cholera and the diffusion from that centre coincident with the dispersion of the pilgrims, is a matter of history, and does not require any particular description. One and all of these point to the importance which pilgrimages hold to cholera prevalence.

Having introduced the subject by a reference to past events, I shall now record the facts relating to the Ardhodoya Jog as held at Calcutta and other sacred places near Calcutta in February last, and give a short account of the Hurdwar Kumbh fair of April 1891, at both of which I had the good fortune to be present and at each enjoyed exceptional opportunities of studying the gathering from a health point of view.

The Ardhodoya Jog comes round at rare intervals, happening only when the moon is in conjunction with the sun in a certain latitude of the Indian zodiac. This event, it appears, only occurs once in 27 or 28 years, and is then made the occasion for a great bathing festival. The one about to be described took place on the 8th of February of this year, the previous one having happened 27 years ago, on a Sunday, on the 7th of February 1864. The purity to be attained by bathing during this festival is exceptionally great, and therefore the gathering of pilgrims at the several bathing shrines on the Ganges was, on its own merits, a very large one; but it was further increased, owing to a rumour which had gone abroad that this was the last

Jog, and that nine years hence the Ganges would lose its sacred character. The Pundits, however, are not unanimous on this point, and it is curious that the same rumour got abroad in 1867, on the occasion of the Kumbh festival at Hurdwar. Nothing, however, seems to have been the outcome of the rumour, for the Ganges at Hurdwar is held to be as sacred now as ever it was. Be this as it may, Bengal, and especially Eastern Bengal, was much interested in the Jog, and the inhabitants flocked to Trebani, Nuddea, Calcutta, and Kalighat in immense crowds.

Kalighat is situated in the suburban area of Calcutta, on Tolly's Nulla, a small tidal creek, which is held to be more sacred than the Hooghly, because it is believed to be one of the original beds of the Ganges which has gradually silted up. At Kalighat, as its name would indicate, is a temple dedicated to the goddess Kali. Near the temple are several ghats leading down to the sacred waters of the nulla, where at all seasons the inhabitants of the locality, Hindu visitors from Calcutta, and pilgrims from different parts of Bengal, may be seen in ordinary times of festival performing their ablutions and ceremonial rites. The nulla can be waded across at low tides, and serves as an outfall and sewer for the surrounding districts, and in spring tides it frequently overflows its banks, and renders the flooded portions of the adjacent land feverish. Along its bank on both sides houses and huts are built, the sulliage of which, and drainage from the latrines, find an easy and convenient outlet into the streamlet. Soiled clothes of the sick and healthy are washed here, and oxen, buffaloes, horses, goats, and other animals, take their bath in the water. As the nulla has frequently passing through it many country boats, the boatmen add to the prevailing pollution; finally, several miles to the east, the nulla joins the stream into which the sewage of Calcutta is discharged. Such, then, is the sanitary condition of the nulla, to which the pilgrims flocked on the 8th of February 1891. It will be noted that the nulla is not a quick-flowing stream; that, on the contrary, it is very sluggish, and only slowly rises and falls with the tide; its breadth is about 160 feet; beyond the tidal changes, the elements of self-purification to any marked degree are non-existent.

Let us turn now to other topographical features of Kalighat. Like Calcutta generally and the suburbs in particular, Kalighat possesses a large number of tanks or ponds round which the huts and houses of the inhabitants are built, and which are the drainage cesspools of the locality. Much has been said concerning the filthiness of these tanks. They more or less resemble pea-soup in colour, and their composition has been officially reported as similar to concentrated London sewage. Those conversant with the uses to which these tanks are put, will not be at all surprised at this statement.

I have given in Appendix A. the analysis of some tanks at Kalighat for the purpose of showing the nature of the ponds of filth which are resorted to for the cleansing of utensils and the soaking, maceration, and washing of the rice and dahl, and in the preparation of food and sweetmeats. No analysis is needed to determine their unsuitability for use for domestic purposes, because the colour of the water and its smell is sufficient to condemn its purity. For drinking purposes Tolly's Nulla water is the main supply. Recently, owing to my representation as to Kalighat being a perfect hot-bed of cholera and disease, a few standposts connected with the Calcutta water supply have been erected near the temple, and a tube-well, sunken some years ago outside of the police station, has been repaired and gives a moderately pure supply.

Huts and houses have in the course of time sprung up in the vicinity of the temple; they have been constructed without order, attention to ventilation, or any arrangements for drainage, and often without ordinary latrines. Land in the neighbourhood has acquired a fictitious value, for, owing to the advent of pilgrims throughout the year, the owners of the huts and houses are able to make large incomes from crowding visitors into these unhealthy hovels. Without then a good water supply, or drainage, or a proper mode of disposal of the excreta and sulliage, with crowding together of huts and houses irregularly placed, and with a filthy tidal nulla which is practically the sewer of the district, and with the numerous polluted tanks, Kalighat, it may be surmised, is at no time a healthy spot and at all times a danger to pilgrims.

It was therefore with great concern that I heard accidentally in the last days of January that an unusually large gathering of pilgrims would likely take place on the 7th and 8th of February. Steps were taken at once to meet the emergency; a large house was procured and converted into a hospital for patients affected with cholera

and other diseases. Two resident doctors were appointed, nurses provided, and arrangements made to equip the hospital fully. A camp was also constructed to give shelter to pilgrims too poor to obtain lodgings, and who in consequence would be exposed to the vicissitudes of the weather. Special public latrines, attended to by the municipal mehters, were erected at convenient places. Extra measures were taken to ensure a better conservancy of the locality, and a large number of mehters were detailed off to remove daily all fœcal matter that might be discovered on the banks of the nulla.

Special attention was given to the water-supply, the pressure in the mains being kept up longer than usual, so that water could be obtained from the standposts for at least 18 hours out of the 24, and all the available water carts, 23 in number, were sent down to Kalighat filled with Calcutta water to be replenished morning and evening. The assistance of the police was asked for and cordially given for the purpose of tracing out and sending to hospital sick people and of helping the Health Department.

At least 150,000 people came into Calcutta in the first and second week of February. This estimate errs, if anything, on the side of being under the mark, for the large number who travelled on foot to Calcutta, or who came by boat from villages on the Hooghly north and south of Calcutta, are not noted; 25,000 came by boat up the nulla, 90,000 came by the Eastern Bengal State Railway, and 32,000 by the East Indian Railway. All of these did not settle at Kalighat, many went to friends or were lodged in different parts of Calcutta, still the majority made it their duty to visit Kalighat before leaving for their homes. As the day of the festival approached the crowding and excitement at Kalighat became daily more intense. The scenes at the ghat, in the streets, and in the temple were most picturesque from an artistic point of view, and the colouring such as would have gladdened the heart of a painter. To convey an adequate impression of the crowd assembled would be not an easy task, but some conception may be obtained by several photographs which I had taken on the morning of the 8th. The first is of the nullah taken at one of the hours dedicated to the bath, and showing the crowd of bathers at the principal ghat. The crush is seen to be very great, and it is marvellous that no accidents happened. The tide is low, and the bathers even in mid-stream have not the water much above their knees. The collection of boats, extending as far as one can see, is so great and close together that only occasional glimpses of the water are to be obtained, and these boats are crowded with men, women, and children. One of the other photographs represents the sacred tank, the water of which is believed to possess peculiarly potent virtues in the case of barren women, while the third gives a view of the courtyard of the temple, and the rush of pilgrims up the steps and into the temple on the ringing of the bell, the sound of which is the call to prayers. These views convey an impression of the vastness of the heterogeneous mass formed by groups converging to this centre from different parts of Bengal. The majority of the pilgrims had come straight from their homes and villages to Kalighat, but not an inconsiderable number had come direct from other shrines which they had been visiting, and a few had been on a pilgrimage for a long time visiting Benares, Allahabad, Mottura, Brindabun, Gya, Nuddea, Trebani, and other places, and timing their arrival at Kalighat to correspond with the celebration of the Jog.

Amidst such a throng collected from the area of the endemic prevalence of cholera, it would have been surprising if a few of the number had not arrived with cholera upon them. Several instances of this kind did occur and came to the notice of the authorities. It would also have been astonishing to have had a large assemblage of people at such a place as Kalighat in which cholera is seldom absent for any considerable time without an outbreak. The outbreak that did occur soon appeared. In the last fortnight of January, from the 15th to the 31st, there has been 12 deaths from cholera among pilgrims, and none among the residents; two of the 12 arrived at Kalighat ill with cholera. In the first five days of February there had been nine deaths from cholera at Kalighat, six of whom where pilgrims. On the 6th there were three deaths, all pilgrims; on the 7th, 13 deaths, every one of whom were pilgrims; on the 8th, 13 pilgrims and two residents died; on the 9th, 28 pilgrims and one resident; on the 10th, 41 pilgrims and three residents; on the 11th, 51 pilgrims and one resident. This was the highest number in one day. On the 12th, 35 pilgrims died, after which the mortality decreased rapidly, as will be seen in the following statement:—

Number of Cholera Deaths in Kalighat during the month of February 1891.

Date.	Number of Deaths.	Pilgrims.	Residents.	Date.	Number of Deaths.	Pilgrims.	Residents.
February 1891, 1	2	1	1	Brought forward -	232	218	14
2	2	1	1	February 1891, 16	4	4	—
3	3	3	—	17	5	4	1
4	2	1	1	18	9	7	2
5	—	—	—	19	—	—	—
6	3	3	—	20	2	1	1
7	13	13	—	21	—	—	—
8	15	13	2	22	—	—	—
9	29	28	1	23	1	1	—
10	44	41	3	24	2	2	—
11	52	51	1	25	—	—	—
12	35	35	—	26	—	—	—
13	10	10	—	27	1	—	1
14	9	8	1	28	1	1	—
15	13	10	3				
Carried forward -	232	218	14	Total - -	257	238	19

In the course of the month 257 deaths from cholera were registered at Kalighat, of which 238 were pilgrims. In addition to these 37 deaths, 21 among pilgrims and 16 among the residents, also occurred during the same period at Chetla, which is immediately opposite Kalighat on the other side of Tolly's Nulla.

Fewer deaths took place on the Chetla side owing to the fact that few pilgrims remained on that side of the nulla, because the suspension bridge, having become unsafe, had been closed by the police, and the pilgrims, being unable to get conveniently across to the temple preferred to stay on the Kalighat side. The character of the disease was far from mild. I have never seen anything so sudden or so fatal; 75 per cent. of those admitted to the hospital died.

In determining the causes of the outbreak the following facts require to be borne in mind:—1st. That the gathering took place in a locality seldom free from cholera; that the pilgrims themselves were not completely free of cholera on their arrival at Kalighat; that a cholera corpse had been thrown into the stream on the 7th from one of the boats; that the latrines on the bank find an overflow into the nulla; that in spite of the vigilance of the police and the energy of the Conservancy Department, an inspection, on the morning of the festival, of the banks of the khal at low-tide showed much fœcal pollution down to the water's edge, and that the sulliage from the district surface drains flows into the stream. Analysis of the water showed twice as much albuminoid ammonia on the 8th as on the preceding and following days. And a microscopic examination of the water showed it to be filled with micro-organisms and epithelial cells. Unfortunately, my time was so much taken up with administrative work that I was unable to separate the several microbes and cultivate them. The opportunity was an excellent one, but most of these opportunities are lost in India owing to administrative overwork shutting out the possibility of carrying out much more important scientific work.

Further, a large proportion of the pilgrims would not drink filtered water. They had come, as they said, to bathe in and drink Ganges water, and they would have none from the standposts or the carts. Happily the tube-well near the police station was not considered unholy, and it was in great requisition by the pilgrims; a dozen of these in different parts of Kalighat would have been very useful. These facts combined with two others—firstly, that very few residents were affected except on the Chetla side, the majority of those residing at Kalighat using by preference filtered water; secondly, that none of the large number of Police Inspectors, conservancy inspectors, carters, and coolies were affected, led me to believe that the outbreak was mainly due to the contaminated water of Tolly's Nulla. This conclusion was in a manner supported by later outbreaks at a distance from Kalighat on the banks of the nulla, and which were clearly traceable to the nulla water. The suddenness of the reduction of deaths at Kalighat, I attribute, to the dispersal of the pilgrims.

Many of the pilgrims began to disperse after their bath and puja on the 8th. There was, however, a tendency on the part of many to linger for three or four days at the scene of the festival, and there were others who had not been present on the 8th who came in on the 9th and 10th. To allow the pilgrims to remain longer than absolutely necessary, was only to add intensity to the outbreak, so it was determined to disperse them as soon as possible. Accordingly, on Wednesday night, the 11th, it was notified

that the Health Department would hold an inspection of the lodging-houses, and that owners who had an overcrowded house would be prosecuted. The effect of the proclamation was that during Thursday the 12th and Friday the 13th, there was a general exodus of pilgrims from Kalighat, and by the 14th very few remained. The departure of the pilgrims will explain the sudden decrease in the number of cholera deaths which took place on the 13th, 14th, and 15th.

Though the dispersal of the pilgrims checked a larger outbreak at Kalighat, which would have only widened its circle afterwards, it could have no possible effect in preventing those already infected from suffering on the way home. Consequently, at some of the principal railway stations sick people had to be taken out of the trains, while passengers by boat died on their voyage, and their bodies were thrown overboard, and travellers on foot were picked up dying and dead on the roads. All of these, however, did not come from Kalighat and Calcutta, and as it is impossible to separate pilgrims who went on the occasion of the Ardhodoya Jog to different places on the Hooghly and Ganges, it must be understood that the details later on referring to what happened to the pilgrims on reaching their towns and villages, includes pilgrims from different bathing shrines.

We shall see later on how a number of the pilgrims fared on reaching their homes and the after-effects of their return; in the meantime, the effect which the pilgrim gathering had on the cholera mortality of Calcutta may be considered. This was marked by a rapid rise taking place in the death-rate as noted in the following statement:—

Statement showing the Number of Cholera Deaths during January, February, and March 1891, *in the town* and suburbs with the corresponding mean for five years.*

Week ending. Month and date.	No. of Cholera Deaths.	Mean for past Five Years.	Week ending. Month and date.	No. of Cholera Deaths.	Mean for past Five Years.
Town.			Suburbs.		
From 1st to 3rd January 1891	10	10	From 1st to 3rd January 1891	9	11
January 1891, 10th	20	26	January 1891, 10th	22	21
Do. 17th	30	25	Do. 17th	24	27
Do. 24th	35	29	Do. 24th	24	24
Do. 31st	42	30	Do. 31st	44	29
February 1891, 7th	56	40	February 1891, 7th	68	23
Do. 14th	183	33	Do. 14th	355	26
Do. 21st	192	25	Do. 21st	149	25
Do. 28th	92	38	Do. 28th	52	37
March 1891, 7th	50	36	March 1891, 7th	41	34
Do. 14th	27	40	Do. 14th	38	30
Do. 21st	39	39	Do. 21st	62	39
Do. 28th	27	38	Do. 28th	29	36
From 29th to 31st March 1891	11	19	From 29th to 31st March 1891	11	18

* Town of Calcutta refers to the town as understood before part of the suburbs was amalgamated with it Suburbs refers to that portion of the suburbs which was amalgamated with the town.

The above table shows a total for the town of 137 cholera deaths in January, 523 in February, and 154 in March; and for the amalgamated suburban area, 123 in January, 624 in February, and 181 in March. The subjoined statement gives the number of cholera deaths among residents, pilgrims, and strangers in Calcutta and suburbs during January, February, and March.

	Town.	Suburbs.
	R. P.	R. P.
Total deaths in January	137=131 + 6	123= 99+ 24
Do. February	523=258 + 223 (*42)	624=284+340
Do. March	154=138 + 16	181=166+ 15

* Forty-two strangers not known, whether pilgrims or not.

From a not unusual number of deaths in January the mortality of the town of Calcutta ran up to 523 deaths in February, which is the highest number in that month since 1866 and more than half the mortality from cholera in Calcutta during the past year. A similar increase took place in the suburbs, the greater portion of the mortality being in the districts near Kalighat. By the end of March the mortality had again become low. Now, this outbreak and its behaviour is contrary to the ordinary seasonal bearing which characterises the prevalence of cholera in Calcutta, which increases in March and generally rises to its maximum in April. Moreover, the epidemic, preceded as it had been by two years of very low mortality from cholera, consequent on the introduction of a better water-supply, consisted of a sudden and severe outbreak followed by a return to the former low mortality. In the town, of the 523 deaths from cholera in February, 223 were pilgrims and 42 strangers. If we only consider up to the 15th February inclusive, even a larger proportion are pilgrims, for out of 260 deaths, 160 were pilgrims. In the suburbs the proportion is even higher, for out of 640 deaths, 340 were pilgrims.

The effect of the pilgrimage on the Calcutta mortality being as described, the next point of inquiry which arose was what was the effect of the pilgrimage on the returning pilgrims and on their home villages? Desirous of ascertaining this information, I prepared the following questions in the form of a circular:—

1. The name of town or village, population; description of water-supply and whether liable to pollution or not?
2. Has any outbreak of cholera taken place since arrival of pilgrims?
3. What is the date of the first case of the outbreak?
4. What is the extent of the outbreak?
5. How long has it continued?
6. How long was the place previously free of cholera?
7. What is the date of arrival of pilgrims?
8. From what sacred bathing place did they come?
9. With reference to the first case of cholera in the village or town, state whether it is a pilgrim or connected with a pilgrim's family, or in any way connected with the transit of pilgrims.
10. Give the history, if it can be ascertained, of any pilgrims attacked with cholera immediately before arrival or several days after.
11. Give a rough sketch of the main lines of communication of the locality, and mark the dates at the places in which the first well authenticated cases of cholera occurred, red ink denoting pilgrims, black ink *not pilgrims*.

And with the permission of the Postmaster-General of Bengal despatched it to the postmasters of about 100 villages in different parts of Bengal, asking them to make inquiries in their respective villages and answer the questions in the circular. About one-third of them responded to my request, and the answers of some are of a most intelligent character, which I am not surprised at, as I am given to understand that the postmaster is often also the schoolmaster of the district. The circular was issued while every event was fresh in the minds of the villagers, as I felt that delay for a month or two would obliterate distinctness, after which the information could be only of a vague, general, and unreliable nature. The reason for choosing the Postmasters for the inquiry was that the circles of the post office were smaller than any of the medical circles, and that consequently the Postmaster was in a position to ascertain even more accurately than any of the Assistant-Surgeons in the district the circumstances connected with the advent of cholera into the villages within his jurisdiction.

It would serve no good purpose to give their answers *seriatim*. One remarkable feature of most of the reports is the constant reference to the scanty and polluted water-supply of the villages in question. It is quite apparent from these reports that the *Sanitary Department of Bengal needs to be more active in its attention to the water-supply of villages*. In some instances my questions were not answered, in others they were misunderstood, and few gave the full information which one would have liked, but sufficient was communicated to show that many of the pilgrims fared badly on their return to their villages, and that the disease which they brought with them did not confine itself to the pilgrims.

From a summary of the answers it transpires that in 26 villages inquired into in different parts of Bengal, pilgrims on their arrival or soon after their arrival, fell ill with cholera, and that they were the first cases affected with that disease in their village, and of the 26 villages information is given of the disease having spread to the residents in 13. True, in most cases the extension does not, according to the accounts, seem to have been great. This may be due to the information having been gathered early, before there was time for much of an outbreak, or that there was actually no tendency on the part of the disease to spread in epidemic proportion.

This immunity, however, did not obtain in Burdwan in the villages of one district, of which I enjoyed special facilities for inquiry, my assistant, Dr. Dutt's native village being one of them. With the help of Dr. Dutt and the postmasters and some of the residents, I was enabled to procure a fairly accurate history of the events connected with the return of pilgrims to five villages, wherein 88 cases were reported, and this information was later on verified and extended to other villages by the facts gathered by Dr. Price, through an assistant sent on special duty, to the cholera affected districts.

Briefly—

Gobindpore had	10	cases	In the month of February all of these villages were infected from without; four by pilgrims and one by a boy coming ill from an infected village.
Pallesy „	49	„	
Barso „	6	„	
Saligram „	11	„	
Jamar „	12	„	

Besides the information from the postmasters, I obtained through the kindness of Dr. Hilson, Inspector-General of Civil Hospitals for Bengal, answers to my circular from several of the Civil Surgeons and Assistant Surgeons in Civil Medical Charge in Bengal.

From both Bhaugulpore and Noakhally, distant divisions of Bengal, answers came to the effect that the pilgrims had no influence whatever on cholera prevalence there. Opinion of Dr. Beatson :—

With reference to your demi-official forwarding a circular from Dr. Simpson, Health Officer of Calcutta, I have the honour to send you the following information :—

For the period February 8th to February 28th, eight cases of cholera were reported as having occurred in the whole of the Bhaugulpore District, the population of which is 1,966,158; of these seven were reported from the Peerpointee outpost and one from the Belhur outpost.

The information obtained from the police is as follows :—

1st. With regard to the cases reported at the Peerpointee outpost, a party of men crossed the river to Karagola for the purpose of cutting grass, and while so engaged were attacked with cholera and some died, six of those who returned were afterwards attacked, and a few days afterwards the seventh case occurred. There was no further spread of the disease. The head constable reports that there was no gathering of people for the purpose of bathing on the bank of the Ganges at Peerpointee, that those who went there to bathe went away after bathing, and that no outbreak of cholera occurred.

2nd. With regard to the case at Belhur the report of the head constable states that about 8,000 pilgrims passed through Belhur on their return from Sultangunge, that they drank water from wells and from the Burwa stream, which, he says, is not polluted. That no outbreak of cholera occurred amongst the pilgrims. From further inquiry from the District Superintendent of Police I am informed that the case reported at the Belhur outpost had no connexion with the assembly of bathers at Sultangunge.

Dr. Mookerjee's letter :—

In reply to your letter, dated 9th ultimo, I beg to state that pilgrims from Ardhodoya Jog attacked with cholera returned to several places in the district of Noakhally, but nowhere was there any outbreak of cholera, or even the appearance of it which could have been attributable purely to these returning pilgrims.

As an instance, I may state what occurred under my own observation in the town; here four pilgrims returned with cholera contracted in the way; they remained in the place until cured or dead, but not a single case of the disease resulted from their advent.

Cholera was present in different places in the district prior to the return of the pilgrims, and in localities where the disease had subsided or was absent, the return of these pilgrims did not at all appear to have any effect either in renewing or producing the malady.

The answers of the other medical men have been summarised in the accompanying statements [not reprinted], one of which includes the *towns*, others the *villages*, and the remainder different *thannahs* of a district which consists of a certain number of villages.

Of the eight *towns* referred to (Rungpore, Faridpore, Madaripore, Pubna, Serajgunge, Kulna, Dinagepore, and Burdwan) all had had a few of the residents affected in addition to the pilgrims belonging to or passing through the town who had been attacked. In seven towns the first person attacked was a pilgrim, and in the eighth, though the first individual affected was not a pilgrim, yet he was in a family visited by a pilgrim who was himself in apparently good health. The eight towns had been free of cholera for varying periods preceding the advent of the pilgrims. Pubna had, however, only been free three weeks, Madaripore one month and a half, whereas cholera had not been known in Dinagepore for many years and in Rungpore not since July 1889.

The statement of the Assistant-Surgeon of Madaripore regarding the mortality of passengers on the native craft passing Madaripore from Kalighat, Calcutta and Nuddea, and the remarks of other correspondents as to the numbers of pilgrims being taken out of the train ill or picked up on the road on their way to their homes, explains the reference of some of the postmasters to the pollution of river water by cholera corpses and to the non-cremation and non-burial of others.

Of the information obtained regarding the villages, that from Dr. Price, who confined his inquiries to two thannahs of his district (Burdwan), is very complete. The villages dealt with had been free of cholera for a long time. Of 11 villages, in seven the first case was in a pilgrim, in one the first case was not in a pilgrim but in a pilgrim's family, in the remaining three the first case was not in a pilgrim, but cholera did not appear in these three villages until nearly three or four weeks later, and fugitives from affected districts came to these villages.

The extent of the epidemic in the 11 villages is shown by comparing the population and the number affected.

In Pallesy, a village of 1,250 inhabitants, there were 105 cases in less than two months, that is, one in every 12 of the inhabitants was attacked. This we might rightly term devastation. The disease, it may be noted, had not been in this village for eight years. This fact may have had something to do with its virulence. I am disposed to think that in those localities where cholera is nearly always present in a slight degree throughout the year that a large proportion of the inhabitants obtain their immunity from the fact of having become gradually accustomed to small continuous doses of microbic poison, which would disturb those who had not been subjected to the process of immunisation, and it is only when they have accidentally swallowed a much larger dose than usual that they become affected.

Singalee, another village with a population of 560 had 76 of its inhabitants attacked or more than one in eight of its population. Montessur, a village with 1,335 inhabitants, had 98 cases up to the date of the report, and the disease had not abated.

The returns from Dinagepore villages give particulars of 14 villages attacked, some of them not having had cholera in them for a number of years; in the 14 villages there were 399 cases, of these 131 were returned pilgrims. In 12 villages the first case was in a pilgrim, whilst in the remaining two villages, the first case was in a pilgrim's family. In Paikpara, a small village in which cholera had not been known for over 20 years, one in seven of the inhabitants were attacked.

Next to Dinagepore is the Bogra District, and here the mortality from cholera since February has been great. The number of deaths were 170 in February, 467 in March, and 441 during the first half of April, giving a total of 1,078 deaths.

Dr. Narayen, the civil medical officer in charge, forwards the particulars connected with five different villages in the district, in all of which cholera had been absent for two or more years, and which became affected on the return of pilgrims. The town of Sherepore is also given, but there cholera existed last year.

Rungpore district is the next in which an epidemic is attributed to the return of the pilgrims. The information, however, is not so complete as that in the Burdwan, Dinagepore, and Bogra districts, and far more general. It will be seen, however, from the list of thanahs and outposts [not reprinted] given that every thanah and outpost was affected. Cholera existed only in three out of the 21 in January, but in February, after the return of the pilgrims, all were attacked. The epidemic had not abated in March, when 765 deaths from cholera had been reported in February and 3,636 in March. It must be understood, however, that cholera is annually present in a mild form in most of the thanahs, but has not been known for a long time to have presented itself with such virulence or widespread prevalence.

History of Cholera in the District.—R. M. Banerjee, Assistant-Surgeon in civil medical charge, says that the whole district of Rungpore was entirely free from cholera, excepting Ulipore, Nelphamari, and Gobindgunge, which returned death from cholera in January 1891—Ulipore returning 37, Nelphamari six, and Gobindgunge three.

In February cholera spread all over the district. The incidence of the disease in all these places was after the return of the pilgrims. It was chiefly confined to them, and they contracted the disease before or immediately after their arrival. Numbers of pilgrims died on the roadside. After the pilgrims' arrival at their homes the disease began to spread in all directions, when the number of deaths among them was very high. I went up to Kurigram on purpose to see the spread of cholera. The cholera hospital at Kamira was full. Numbers of dead bodies remained unburied along the Kurigram and Mogulhat lines. Up to the 16th February the disease was chiefly confined to the pilgrims, and none of the villages bordering on the lines were attacked

with cholera. Subsequently, the disease spread and is still raging throughout the district, but fortunately the municipality is "up to date" free of cholera.*

In the villages of Goalundo sub-division the cholera is reported to have been of a mild nature. Out of 27 villages cholera was prevalent in five prior to the Ardhodoya Jog. Cholera appeared in the other 22, and it is reported by the Assistant-Surgeon through the civil surgeon that the first cases in all the villages were amongst return pilgrims or their families. In the 22 villages there were only 53 deaths altogether. The report regarding the villages of Fureedpore gives a map showing a very large number of villages attacked with cholera after the return of pilgrims, where 1,634 deaths had occurred, but states that no positive history could be obtained about the villages, that sporadic cases are very common in the district, and that though the outbreaks occurred after the return of the pilgrims, it was impossible to ascertain whether pilgrims were first affected in these villages or their friends or their neighbours.

The district of Jessore is interesting as presenting an example of no particular impression having been made on it by the return of the pilgrims. In those cases where pilgrims died after their return to their village, the disease either limited itself to the pilgrims or did not extend to any marked extent. Many of the villages had cholera cases in them previous to the return of the pilgrims, and a large number of them are seldom long free of cholera. The Assistant-Surgeon in civil medical charge reports as follows :—

> The questions set by Dr. Simpson, Health Officer, Calcutta, are replied to as far as could be ascertained from incomplete cholera reports supplied by the inspectors of the several police stations in the district, to every one of whom those questions were issued for information. These reports have been received from Sudder Jemadar and Magura sub-divisions, where cholera is said to have broken out after the return of pilgrims from the several bathing places. Reports have also been received from the sub-divisional officers of Bongong and Narail. From the Bongong report it appears that cholera had been raging there prior to the date of the Jog, and that the cases which occurred there had no connexion with the transit or return of pilgrims. Five pilgrims who had been attacked with cholera travelling by the Bengal Central Railway were detained in Bongong for treatment, three of whom died and two recovered. The report from the sub-divisional officer of Narail states that cholera did not break out after the return of pilgrims, though the disease had been prevailing in the place since December last.

Such then is the history of a large festival in the endemic area of Bengal and its wide-reaching effects so far as has been investigated. From it an estimate may be formed of the influence the pilgrimage had on cholera prevalence among the pilgrims themselves; secondly, among the general population. The evidence is such as to show that to the pilgrims themselves it has been a most disastrous affair; that in many villages the residents who did not attend the bathing festival have suffered on account of the return of the pilgrims; and that in three districts at least a widespread epidemic has been set up.

It would be folly on the one hand to attribute all cases of cholera in the endemic area this year to the effect of this pilgrimage. Cholera existed in many districts prior to the pilgrimage and visits some villages annually. What may be the cause of the annual visitation has never been made out, and never will be until thoroughly investigated, which at present is not attempted. On the other hand, there is abundant evidence to show that cholera went home with the pilgrims, and that in some villages which had been free of cholera, it broke out first of all among the pilgrims or those connected with them, and then spread throughout the village. This is an incontestable fact, and what happened in the villages noted is as likely as not to have happened in the villages where no inquiry was made. It is no answer to this contention to bring forward a few negative cases in which pilgrims have arrived in their villages, have shortly afterwards been affected and died of cholera, and yet the disease has not been communicated to others. Similiar examples can be quoted regarding even the most infectious diseases. I am not contending that cholera is either infectious or contagious, though I can easily conceive circumstances in which it may be one or the other, but in regard to those instances brought forward as demonstrating its non-communicability, I can only say, it would be exceedingly curious if in every instance the water-supply and food, which are the ordinary media of communicability, were contaminated, and that in every instance *that* contaminated water-supply or food was partaken of by others.

Illustrations of the frequent non-communicability of cholera are common in Calcutta, even when the disease is introduced into a bustee which corresponds in several respects with the country village. But illustrations are also frequent of its communicability,

* Not taking into account the slight outbreak on the first arrival of the pilgrims at Rungpore.

of which the following, wherein 14 persons were attacked in a bustee after the return of three affected pilgrims is only one of many instances.

Munshipara bustee is situated in Ward No. 3 extended portion of Calcutta. It is without any drains, and dirty water from privies, &c. either soak into the soil or drain into the tanks or ditches bounding the bustee. There are three tanks, the water of which is used by the people for washing clothes and utensils and also for bathing. The nearest standpost is not within 150 feet of the bustee. There are no bathing platforms or urinals. The bustee is inhabited by a poor class of Mahomedans, mostly tailors. It was free of cholera for several months. About the middle of February last a few of the people of the bustee went to a fair called Gorachand's Mela, which is held every year on the 20th of February at Harna, a village in Balanda fiscal division and Bashirhat sub-division. The mela is frequented by both Hindus and Mahomedans. Cholera broke out during the continuance of the fair, and three men of the party were attacked with symptoms of diarrhœa, in consequence of which they came back to their homes on the 26th of February. On the 27th the three were attacked with cholera. The first death took place on the 28th, the second on 2nd of March and the third on the 3rd of March. The fourth case was at the next house of the first deceased, and occurred on the 4th March and died on the same day. The fifth and sixth were attacked on the 5th March, and were the daughters of the second deceased; one died on the 5th and the other on the 6th. The seventh case was a neighbour of this, and was attacked on the 6th and died on the 7th. Two fresh cases occurred on the 7th in the next house, one of which recovered, and the other died on the 10th. The next case occurred in the adjacent house, on the 8th, which recovered. The ninth case of death occurred on the 12th, and the tenth case on the 15th; both were attacked on the 11th. Two more cases occurred in the house of the ninth deceased, one on the 12th and died on the 13th, and the other on the 13th and died on the 14th. Three more cases occurred in this house, but they all recovered. Altogether there were 17 cases of cholera in this bustee between the 27th February and 14th March, and 12 of them proved fatal. The use of the tank water was discontinued by placing a police guard, and the disease has not made its appearance since.

In the same manner I take it that extension through a village in the country takes place, and the spread from village to village is through human intercourse, *i.e.*, importation of the cholera germ from an infected village to a healthy one. Of course, this does not lose sight of the possibility of a small contaminated streamlet passing through several villages, being the cause of extension in those villages without human intercourse, nor do I lose sight of endemicity in certain villages, but endemicity, I am beginning to think, is like a will-of-the-wisp, the more one follows it up the further it goes from one.

As regards the influence exerted by pilgrims in the diffusion of cholera, perhaps one of the most striking instances is that often related by Brigade-Surgeon Coates, in which the Chief Commissioner of the Central Provinces in 1864 or 1865 turned the Bombay pilgrims, who were on their way to Pooree, off one route on to an entirely new one, preventing them from passing through Raipore and Sumbulpore to Juggernath, because they always brought cholera with them. The pilgrims were obliged to pass through the Khond country or Northern Sircas, keeping to the south of the Mahannudy instead of to the north. The Khond country had been pointed out as one in which no cholera had ever occurred, and different theories regarding the soil and climate had been framed in explanation of this absence of cholera, but with the advent of the pilgrims, all these theories fell to the ground, for cholera broke out and decimated the villages, causing an untold of mortality.

Having thus carefully considered the Ardhodoya Jog as held in the endemic area and its influence on cholera diffusion and prevalence, let us by way of comparison turn to the consideration of the Hurdwar Kumbh, an equally important festival celebrated in the non-endemic area. It will be necessary to deal with the position of Hurdwar and its topography, because these form very important factors in any consideration of the relationship of its pilgrimages to disease. First of all, it is far removed from the endemic area. That is one very important item, and it was mainly because of this circumstance that I visited Hurdwar at the time of the recent Kumbh, believing that there, if anywhere, an opportunity would be given of ascertaining whether cholera can arise *de novo* in a large Indian gathering, or whether the disease must be imported before any outbreak can take place, and in the event of an outbreak what were the conditions existing or non-existing to favour or check its spread.

If one is to be guided by the recorded numbers who attended the Kumbh festival in 1867 and on previous occasions, but which are believed to be over-estimated, that of

1891 was insignificant in comparison with those preceding. Nearly 3,000,000 of people were estimated to have attended the fair of 1867, and that number was expected this year. Arrangements were made by the railway authorities to run 40 trains a day, and their disappointment may be imagined when the largest number even on the day before the great day did not reach 20, and on some days instead of 40 trains only three or four were in demand. Still the gathering was larger than any other that takes place in India. It is a most difficult thing to compute a vast assemblage such as was collected at Hurdwar on the 12th of April last. Various were the estimates, ranging from half a million to a million. I think, however, the numbers are not over-estimated if they be calculated at nearly 700,000. The railway did not bring many more than 2½ lacs, but the vast majority of pilgrims came by road, and a most picturesque and unique sight the travellers presented. On they came in groups of 20 and 30, some with camels to carry their belongings, the richer few on elephants, the majority in immense bullock carts, which seemed capable of holding not only a household but an unlimited number of household goods, some rode on ponies, some brought donkeys, while others were accompanied by samburs and other animals. A vast number travelled on foot carrying bundles on their heads. The variety of dress, of colour and of form was most interesting and instructive. The pilgrims came from all parts of the north-west and the Deccan, a great number from the Punjab, many from Kashmir, some from Afghanistan and a few from Bengal. The Maharajah of Durbhunga with his followers was there, and so was the Maharajah of Kashmir.

One of the most remarkable features of the crowd was the very striking contrast in physical appearance which it presented in comparison with the pilgrims assembled at Kalighat. The Bengal pilgrims at Kalighat included a large number of exhausted, emaciated and ill-conditioned and feeble men and women, but those who came to Hurdwar were of a totally different stamp. Well-conditioned and apparently well fed, they were incomparably superior in build, health, hardiness and strength. The majority were strong and robust, none the worse for their long marches, but on the contrary, a great deal fitter in every way to undergo the fatigues and exposure of the return journey. The women appeared to be as strong as the men, well nourished, with well-shaped limbs, fine figures and contented faces. The pilgrims are excellent walkers; they will walk hundreds of miles and time themselves as to arrival at their destination. They know how far they can march per day, and exactly how many marches will take them to their journey's end. When the different groups had spread themselves out and encamped in the open plain, a visit through the camp impressed one that for the majority the pilgrimage was a gigantic and very enjoyable picnic, and did most of them, men, women and children, an immense deal of good. A few there were, no doubt, who were old and feeble. Of these some had come to Hurdwar with the desire to die in the holy place, but these were exceptional cases.

The reason for fewer attending this fair seems in a measure to have been due to a rumour having got abroad that the Government was not in favour of a very large gathering, and that the "Sirkar" discountenanced the coming of pilgrims from districts in which cholera prevailed. Sir H. Ramsay's influence in the Kumaon Hills appears to have been so great among the tribes there that the Paharis, who are an exceedingly dirty set of people, and among whom cholera was then prevalent, instead of coming in their thousands, stayed away, the number arriving being limited to about half-a dozen. Perhaps the recollection of the great mortality from cholera to which they were subjected in 1879, when more than 1,600 succumbed to cholera and other causes, acted also as a deterrent. That portion of the Bijnour district on which the Paharis were accustomed to encamp was, as a matter of fact, almost entirely unoccupied. It was here that in 1879 cholera first broke out among the pilgrims, 61 cases having occurred before the outbreak came to the knowledge of the sanitary authorities. It is just such a place as one might expect an outbreak to occur. For, from some considerable distance down the Nildhari slopes, courses a small and shallow hill stream, which sluggishly winds its way to join the rapid water of the river. And at the foot of the hills and near the streamlet's junction with the river, is a small pond which had been in much use during the last Kumbh festival. The Paharis would naturally squat and encamp along the streamlet, and being a hill tribe would drink its water, which from the encampment would become polluted. To both Surgeon-Major Hutcheson, the present able Sanitary Commissioner of the North-Western Provinces, and to myself, the conditions of the locality appeared to be highly favourable for an outbreak of cholera, and explained the sudden character of the outbreak in 1879. This year the Sanitary Commissioner had the tank filled up, and as neither Bijnouris nor Paharis came to the fair, none squatted alongside of this stream.

Hurdwar itself is delightfully situated on the southern slope of the Swalik range, which has on its north the snow-clad Himalayas. Through a gorge in this range the Ganges escapes into the plains; and as it comes through the widening valley divides into two main streams. Originally there were three streams, but by the construction of the Ganges canal, which is a magnificent piece of engineering, the three have been diverted into two channels which has thereby increased the volume and swiftness of the current. The water is as clear as crystal, very pure and very cold, being practically snow water. On the western bank lies Hurdwar, a small picturesque looking town, nestling under the hills, with the backs of the houses of the main street, which runs through it, looking down on the river. There is a circular road which skirts the hills for a short distance, enclosing most of the houses that make up the southern division of Hurdwar, and which at its two extremities joins the main street, the north junction leading to the sacred ghat. Hurdwar is not much crowded with buildings, and in ordinary times should be a healthy spot. There are several wells, about 20 to 30 feet deep, but most of the water for drinking purposes is taken from the river direct, and is of excellent qnality. Opposite Hurdwar, and between the two main branches of the river is a number of islands intersected by straggling and shallow streams. The chief of these islets is Roree Island, the soil of which, like the others, is made up of river sand, pebbles and boulders. Further south, about three or four miles from Hurdwar, is the small town of Kunkul, which struck me as being more crowded in buildings than Hurdwar, and the wells more liable to pollution. Still further to the south and west is Jowalapore; these three townlets are formed into one District Union.

The climate of Hurdwar and the country around is good, and in April, though the days are hot, the nights are cool. Indeed, when the "Dadoo" blows strongly from the snow-capped hills, the valley may be bitterly cold. The locality is a very favourable one for a large encampment. An extensive and open valley with a porous sandy and pebbly soil, unoccupied except on these rare occasions, and therefore not contaminated with the pollutions of man or beast, is of itself an excellent site, but when that valley is well watered by two main branches of a swift-flowing river, and by numerous shallow rivulets, and is at the same time purified by refreshing aerial currents passing up the valley towards the hills during the day, and is swept by a strong cold wind from the snowy range during the night, the natural conditions of the place are such as to permit of the gathering there of an immense crowd without the dangers which exist in other places. Here nature is strong. Her purifying attributes are at their best, and she is lavish in her gifts. Sluggishness and stagnancy, the two enemies of purity, are absent. The natural advantages of the situation were very evident, and very vivid comparisons arose in my mind between the conditions of Hurdwar and those of Kalighat with its narrow sluggish tidal stream, polluted on all sides, its filthy tanks, its contaminated soil, its pent up and impure air, stagnancy and pollution being the predominant features of Kalighat, while motion and purity are the main characteristics of the Hurdwar District. The full meaning of *locality* was more powerfully impressed on my mind than it ever had been before.

Dr. Hutcheson, the Sanitary Commissioner, and Mr. Paterson, the Magistrate and Collector of the district, who was in charge of the arrangements of the fair, did their best that no assemblage, however large it might be, should alter this condition of cleanliness. The pilgrims as they arrived were directed to certain districts laid out for them, and when these were fully occupied, other districts were taken up. The conservancy and latrine arrangements, as laid down by Dr. Hutcheson, were most complete. Everything was carried away by mehters from the latrines and urinals which were placed at convenient spots, and the contents were trenched or put into deep pits, and so well and effectively was the whole undertaking worked that nothing offensive to sight or smell was perceptible. In Hurdwar and Kunkul town the streets were particularly clean, no sewage or soil water of any description being allowed to drain into or be thrown on to the streets. One man who persisted in violating the rules got a month's imprisonment; this had a most wholesome effect. General hospitals were also in readiness for reception of the sick and the isolation of infectious diseases. A few cases of small-pox were received into the Hurdwar dispensary during the fair. I have already referred to the endeavour to keep cholera from being conveyed to Hurdwar. Isolation hospitals were, however, provided to at once segregate any cholera cases that might be reported. The greatest credit for the attainment of such results is due to both Mr. Paterson and Dr. Hutcheson, who worked most cordially together. The sanitary arrangements practised here had not the

limitation which it is customary in India to attach to sanitation. They went beyond the mere looking after latrines and included attention to water-supply, over-crowding, food supply, lodging houses, and hospitals. In this connexion there was one place which caused a good deal of anxiety to Dr. Hutcheson, the Sanitary Commissioner, and that was a small tank called the Bhimgoda, peculiarly sacred and much reverenced by the pilgrims. The water in this was quite stagnant, and must have become much polluted as bathing went on. Under these circumstances, the Sanitary Commissioner had two small canals cut from the river into the tank, so that a current of pure water was constantly flowing in and displacing that which had been rendered impure. This measure proved to be of much use for on one occasion we saw dirty clothes being washed in the tank which would have contaminated the water to a high degree, had there not been a good current passing through the pool.

Though bathing in all parts of the Ganges at Hurdwar is practised, yet the centre of attraction is the sacred ghat, the Hari-ka-paira, considered by the Vaishnavites to be the feet of Vishnu, and by the Saivites to be the feet of Siva. In olden times much fighting took place for precedence of bathing at the sacred ghat. In 1760 there was a pitched battle between the Gossains and Bairagis, the two most powerful sects, in which 18,000 Bairagis were killed, and victory fell to the Gossains. On another occasion in 1819 the crush was so great that 400 pilgrims lost their lives in passing down the narrow passage of the ghat. The British Government, however, have built a magnificent ghat leading by a flight of 60 wide steps down to the river, and on the 8th and 12th, the two great days in the Kumbh festival, special arrangements are made to prevent accidents dependent on a sudden rush, or in consequence of pilgrims getting too far into the rapid currents of the river. For the latter purpose that portion of the river in front of and for nearly 100 yards to the north of the ghat was fenced in and shut off from the river by a bamboo bridge and some pontoon boats enclosing a pool which at its widest part was not more than 80 feet and at its narrowest about 30 feet. The current through this pool was fairly rapid, but owing to the ghat being somewhat more retired from the river than the adjacent buildings, there was not the same freedom of flow as in the river itself, and at two of its corners there was considerable eddying. This retired position of the ghat deserves special attention, for though well situated for ordinary gatherings, it is not so for extraordinary occasions, such as a Kumbh festival. If this ghat was extended further into the river to be in a line with the buildings on its south side, I believe one of the main dangers of an extensive outbreak of cholera would disappear for all time. It was to this ghat that the Fakeers on the 8th of April came in vast processions, this being one of the holy days, and it was here that I witnessed for the first time a most marvellous spectacle. I thought the crowds at the bathing ghats at Kalighat were vast, but these ever changing ones at Hurdwar surpassed them in every respect. Temporary bridges had been constructed by Government engineers across the river joining Hurdwar with Roree Island, and barriers had been erected at certain places in the streets of Hurdwar. A large police force regulated the order of going and returning from the ghat, and a troop of cavalry were held in readiness to quell any disturbance should such arise, for the different orders of Fakeers, the Narenghenis, Jhunas, Nirbanis, followers of Siva, are not only prepared to fight with the Biragis, Odassees, and Nirmalas, followers of Vishnu, but every sect is jealous of the other, and even of the different orders of which they themselves are composed, and are quite prepared to fight with one another. Worked up to a state of great excitability on these occasions, there are many quite willing to risk their lives in a fray. Each order has its chief priest or Mohunt, whose influence among his followers is absolute, and it is through the Mohunts the authorities work. The appearance of the Mohunts impressed me very favourably. They are as a rule fine, intellectual looking men, quiet, dignified, and polite, evidently given to much reflection or study, and apparently accustomed to be obeyed.

The Fakeers approached the ghat by Roree Island, and having left their elephants and camels at a certain spot, crossed one of the higher bridges, bathed in the pool, returned to Roree Island by a bridge lower down, rejoined their elephants and then marched back to their encampment. Everything had to be so timed that no two processions of Fakeers could possibly meet. The pilgrims approached the ghat from the town, and were let through the barriers according to the judgment of the superintendent of police during the intervals between the processions of the different sects of Fakeers, bathed in the pool, and then passed off by another way. So admirably were the arrangements contrived by Mr. Paterson and his officers, civil and police, that not a hitch took place in the whole proceedings, and what is more marvellous the day passed away without any accidents.

An insight was, on this day, gained into the pollutions to which the sacred pool would be subjected on April 12th, the great bathing day. There was not only the washing of the naked Fakeers, who had covered themselves with wood ashes as their only clothing, and the general bathing of the pilgrims not all in the cleanest of clothes, but several people with skin diseases were seen bathing. Moreover, the ashes of deceased relatives enclosed in little red bags and brought from the different homes of the pilgrims were thrown into the pool, and the hair of widows who had been shorn were thrown into its waters. As the bathing went on the clear stream became a muddy one, and the water collected from any part of it smelt in a few hours offensively, and the micro-organisms developed from it were legion. It seemed too much even for the large Masseer fish which ordinarily frequent that ghat in enormous numbers, for they deserted their usual post and retired further out into the river.

After such an experience I can readily understand how it is that pilgrims, who have bathed in water of this quality and whose clothes are saturated with the polluted water and the microbes contained in it, give off from their clothing at times, and especially in warm sultry days, a very offensive smell. The clothes literally stink, containing in them the elements of decomposition, and one can well understand how readily in this way the clothes of pilgrims may become dangerous to others and to those they visit, although the pilgrims may not be affected by them.

On the evening of the 11th the usual breeze lulled, and for three or four hours the air felt oppressive. This was particularly so in Hurdwar, for being the eve of the great day, a large number of pilgrims had come over to the town, the two streets were crowded, so were the roofs and windows of the houses. Passing, with Dr. Hutcheson, down the main street on an elephant, the air felt hot and close. Coming to the centre of the town, where was one of the town wells, I got down to take a sample of the water. The getting down from the elephant into a lower stratum of air was like plunging into a filth pond, so offensive was the atmosphere, owing to the immense crowd congregated on a calm and sultry night. One could well imagine that if such a condition of matters continued for long, disease in a virulent form would be the result. Here I took a sample of air to compare with a second sample from one of the bridges taken near the middle of the river.

At 2 in the morning of the 12th the bathing began, and on our way to the ghat a little after 6, we met crowds of people who stopped to thank Mr. Paterson, the Commissioner *sahib*, for his wonderful arrangements. They shouted, "Long may the "Empress Raj remain. The arrangements are everything we desire. We have all "we want." When we reached the ghat we went on the roof of one of the adjoining houses to get a view of the country around, and of the bathers. The scene was full of colouring and variety, but that at the ghat baffles description. Such a seething mass of humanity in constant motion on the steps, entering and coming out of the sacred pool, could be seen in no other country, and reminded me of the agitation of myriads of moving creatures which one sees under a microscope in a colony of microbes. We got a glimpse down a part of the street leading to the ghat, and the sight was the same. It looked as if one could easily have walked on the heads and shoulders of the crowd.

On the 12th, at 8 in the morning, there was estimated to pass out of the bath between 400 and 500 bathers a minute. One continuous stream of pilgrims had passed in and out of the pool since 2 in the morning. I was at the ghat in the morning, and again between 12 and 2. On my second visit I procured three samples of water from each corner of the pool, south, east, and north; also air from about the same spot. Other samples I had procured in the morning, and on the 11th from here and several other places.

In order not in any way to be misled by my own views or experiments, I sent samples of the water to Professor Cunningham, and the following is his report:—

I made plate cults of 1 c.c. each of all your samples of Hurdwar water, with the following results:—

1. Ganges, above bathing ghat, 11.4.91, four colonies.
2. Ganges, below bathing ghat, 12.4.91, crowded with discrete colonies.
3. Bhimgoda, 11.4.91, crowded with confluent colonies.
4. Bathing ghat, south corner, 11.4.91, crowded with confluent colonies.
5. Bathing ghat, south corner, 12.4.91, crowded with confluent colonies.
6. Bathing ghat, north corner, 12.4.91, crowded with confluent colonies.
7. Bathing ghat, south-west corner, 12.4.91, crowded with colonies not yet completely confluent.

The only one of interest from a comma aspect is No. 5.

It will be noted that very few microbes are in the river water above the ghat; that two to three miles below the bathing ghat they are numerous, but in discrete colonies, while at all parts of the bathing ghat, the numbers are so great as to form, not discrete colonies, but become confluent.

It will be also observed that at one part of the ghat *comma bacilli* are to be found.

Where did the myriads of micro-organisms in the sacred ghat come from is one question of importance; another is, where did the *comma bacilli* come from?

Could the four colonies of micro-organisms which existed in 1 c.c. of water above the bathing ghat have multiplied to such an extent in the short distance of 100 yards, while travelling through the pool, as to become a confluent mass on culture. If this be granted as possible, there is still the fact to be accounted for that not more than 20 yards from the entrance of the water into the pool, half a cubic centimetre of water gave also a confluent mass. I am inclined to think that in addition to the animal products, washed off from the bodies of the bathers, having furnished to the water of the pool a good nutrient material, that many of the micro-organisms did not make their appearance from rapid reproduction, but were washed off the bodies and clothes of the pilgrims.

Whatever doubts there may be as to the source of the micro-organisms generally, there can be none as to the source of the *comma bacilli*. They were not in the Ganges water before it reached the bathing ghat. They were not in the bathing ghat water of the 11th, and only on the 12th at one of three places, and that only near the main outlet; and this in the afternoon, and not in the morning, when the first sample was taken. We cannot suppose then that they were developed from the natural water of the Ganges, nor from the unnatural quality of the water in the pool, and the only source therefore which suggests itself to me is that they were introduced. In that case the question arises, did they come from the bodies or clothes of cholera-infected pilgrims, or did they come from the mouths of healthy persons? There are two facts against the latter supposition; one that the *comma bacilli* from the mouth are not cultivatable in nutrient Agar Agar, the other that they ought, under the circumstances, to have been found at all times in the pool, for the washing of the mouth was as common at one part as another. Still the suspicion remains, that it is just possible under such very unusual conditions, that the *comma bacilli* of the mouth may have acquired properties which were afterwards favourable to their cultivation in Agar Agar.

The remaining hypothesis seems to be the more probable. Of course, all this assumes that the *comma bacillus* is in some way connected with the presence of cholera which, I believe, is admitted by even those scientists who do not regard the *bacillus* as the *cause* of the disease. We have seen that small-pox, one infectious disease, was imported into Hurdwar with the coming of the pilgrims, and that pilgrims suffering from skin diseases were observed to be bathing at the ghat. A death from cholera took place in the Roorkee circle, only 13 miles from Hurdwar, on the 9th April, in a Fakeer, who was coming on to Hurdwar, whose friends, to the number of four or five, were, it is stated, prevented from proceeding to Hurdwar. Nothing is definitely known, however, of the subsequent movements of the friends of this pilgrim, who may be expected to have continued their journey to Hurdwar as opportunity arose. On the 12th a boy was found dead at Hurdwar, who was supposed to have died of cholera, but there was no history of the case. On the 10th a suspicious case of cholera was reported in an old woman who had only been at Hurdwar a little over one day; she died. On the 8th a suspicious case occurred at Kunkul, which also proved fatal. The history of these two last cases, however, gave one the impression that the symptom of vomiting and purging had been caused rather by indigestible and unsuitable food and bathing in very cold water in the early morning rather than by any specific cause such as obtains in Asiatic cholera. On the 6th, several miles away from Kunkul and Hurdwar, in the Deyrah section, a suspicious case, ending in death, occurred. A *post mortem* tended to confirm the suspicion; but in this case, though searched for, I was left in a state of uncertainty whether there were commas or not in the intestinal secretions. No information or history concerning the deceased could be obtained.

From the foregoing, it will be noted there was the possibility of infected articles of clothing being brought to the ghat, even if no infected person bathed there, which is not unlikely; and this is the only way in which I can account for the *comma bacilli* being found in the sacred pool. There were do *comma baccilli* in the air, for this I

carefully examined. The most interesting point now to be determined is whether cholera broke out among any of the returning pilgrims; and with that object in view I wrote to Dr. Hutcheson, making inquiries, and have received an answer that no cholera cases, as far as he is aware, have occurred among returning pilgrims. Since writing, I have observed a report in the papers that a few cases of cholera had occurred owing to the return of pilgrims from Hurdwar; cholera had broken out at Gurgaon, but the cases were not numerous. It will be extremely interesting to get further particulars. This part of the inquiry is therefore incomplete, and must be finished on another occasion. If *comma bacilli* had not been found in the water, we might have attributed any deaths afterwards to mere poisoning from the number of microbes and their products which the water contained; and this may be borne in mind as a possible occurrence in some instances, and may explain instances of local outbreaks without further spread. But in this instance where *comma bacilli* are found, it is a link to quite another chain of events.

My study of the Hurdwar fair, however, confirms the view that cholera does not occur in a locality outside the endemic areas without importation; also that importation is not by the wind; and thirdly, that the danger of extension, when importation has taken place, lies mainly with contaminated water. Moreover, that sanitation in its widest sense, including attention to water-supply, to purity of air and of soil, to conservancy supplemented by the adoption of measures to keep out, as far as possible, epidemic disease, and in the event of such diseases gaining an entrance to isolate them promptly, is the practical safeguard against cholera.

I must defer to some future occasion a further consideration of the lessons these two pilgrimages teach, and the steps which should be taken to prevent the constant great mortality which takes place on account of pilgrimages in the endemic area.

APPENDIX A.

RESULT of EXAMINATION of the TOLLY'S NULLAH WATERS taken at KALIGHAT; also of TWO TANKS at KALIGHAT.

	Physical Character.	Chlorine in Parts per Million.	Free Ammonia per Million.	Albuminoid Ammonia per Million.
TOLLY'S NULLAH.				
6th February 1891	Colourless and turbid. Reaction, neutral. Smell, disagreeable. Sediment, whitish. H_2S, nil.	25·0	0·32	0·32
High tide, 8th February 1891, 1.30 p.m.	Ditto.	22·0	0·48	0·60
Low tide, 8th February 1891, 4.30 p.m.	Ditto.	15·0	0·40	0·60
High tide, 9th February 1891, 2 p.m.	Ditto.	14·0	0·60	0·32
Low tide, 9th February 1891, 6 p.m.	Ditto.	14·0	0·60	0·32
Low tide, 10th February 1891, 11 a.m.	Ditto.	15·0	0·10	0·32
High tide, 10th February 1891, 5 p.m.	Ditto.	12·0	0·72	0·32
Low tide, 11th February 1891	Ditto.	11·0	0·12	0·32
Kalighat sacred tank, 6th February 1891	Opaque, and slightly yellowish. Smell, disagreeable. Faintly alkaline. H_2S, nil.	180·0	16·0	1·92
Tank north of Kali's Temple, 6th February 1891	Yellowish. Faintly alkaline. Smell, fœcal. H_2S, present.	214·0	21·6	10·0

ABSTRACT OF REPORT OF THE MADRAS MUNICIPALITY FOR 1890–91.

(*Lieutenant-Colonel G. M. J. Moore, President.*)

Black Town Drainage—Pumping Stations.—The additional engine at Royapuram has been fitted up and works satisfactorily, but until No. 2 sewer is opened, it will not be brought into regular use. Drainage.

Sewer No. 2.—In accordance with G.O. No. 1523 M., dated 12th November 1889, and with resolution of the Commissioners, dated 28th June 1889, the work of re-building the four portions of No. 2 sewer referred to therein has been completed.

House Drainage.—The number of house drains altered and repaired by the municipality during the year was 32, and by the owners, 426. This makes a total up to date of 8,663 house drains altered and repaired since the drainage works began.

Mylapore Drainage.—A scheme for draining Mylapore was laid before the Commissioners on the 9th January 1891, when it was resolved that the question should be deferred pending the result of the Report of the Special Committee appointed by Government on the general question of the drainage of Madras.

A few streets were provided with new drains, and the drainage from Royapuram Infantry Lines was connected with sewer No. 1 by a 9-inch stoneware pipe.

Owing to the increased supply during the last few years it was found necessary to alter the scheme as proposed by Mr. Jones. An amended scheme was laid before the Commissioners, and in accordance with a resolution passed at a special meeting of the Commissioners held on the 6th of October 1890, it was forwarded to Government for consideration. During the year under report, 7,810 yards of pipes were laid, and 63 fountains, 42 valves, 198 stop cocks, and five flushing pipes were fixed within the municipal limits. New water-supply.

On the 1st of April 1890, the level of the Red Hills Lake stood at 41·39 and at 37·89 on the 31st March 1891. On the 1st of June, the level of the lake fell to 38·25, and arrangements for pumping the supply were then put in hand, but owing to timely rain and a supply from Sholaveram Lake, the level of the Red Hills Lake did not fall below 36·01, and pumping fortunately had not been resorted to. The quantity of water supplied to the city during 1890–91 was 334,579,842 cubic feet, or 16 gallons per head, for an estimated population of 350,000 within the water-supply area. The water from Red Hills Lake, taken in five different places, was, on chemical examination, proved to be bad in every case. 820 new services were laid by the licensed plumbers during the year, and 825 existing services were extended. Six meters were fixed to private services. The rate for water supplied for non-domestic purposes was, as in the previous year, four annas per 1,000 gallons.

General Review of the Conservancy of Madras.—The collection of night-soil is fairly satisfactory so far as it goes. In the sixth division covered carts collect it during the night. In most of the others it is collected in the morning in iron buckets on wheels. These buckets are taken by coolies to lorry depôts, where they are placed on lorries by which they are conveyed to loading wharves, and the coolies take away empty buckets to continue their work of collection. From the wharves the full buckets are taken to distant depôts at Yellapatha, Mada, Covil, and Manally. At the former it is buried in deep pits, where it must remain for a year, by which time it is converted practically into *poudrette*, which is sold for manure; and at the latter it is sold by the contractor directly to ryots, who cart it to villages at a considerable distance beyond municipal limits. There is also a third depôt near Stirling's Road, where the night-soil brought in carts from the sixth division is buried. Conservancy.

The fourth, fifth, and eighth divisions, however, have as yet no house-to-house conservancy. The inhabitants mostly employ private toties, who bribe the drivers of the open rubbish carts to permit them to deposit it in the carts. This is most objectionable, but it will be practically impossible to prevent it until house-to-house conservancy is introduced in these divisions.

The street conservancy is fairly well carried out, considering the fact that the establishment is hardly sufficient for the work. Most of the streets are cleaned twice a day, though they often look untidy through leaves used for plates and other refuse being thrown out of the houses very soon after. Even if they are deposited in the movable dust-bins, which are excellent from a sanitary point of view, these are frequently over-turned by hungry cattle or by mischievous boys and the contents littered about the streets. One of the chief difficulties in street conservancy is the filthy custom of too many of the inhabitants who use the streets and drains as latrines. This is so bad in some parts of the town, that whole lanes have to be frequently scraped, and the earth removed and fresh sand put down. If this were not done, the stench would become unendurable. The overcrowding of many of the native houses in which it is not uncommon to find a separate family occupying every small room, no doubt partly accounts for the commission of the nuisances outside. Most of the houses possess a small latrine of some sort, but totally inadequate to the numbers residing in them.

The practice of filling putrid tanks and low lying ground not far removed from human habitations with street sweepings containing a large amount of putrescible garbage, which forms the best possible breeding ground for bacteria of various kinds, has been generally condemned by sanitarians. It is still partially resorted to in Madras as being the only practicable method of removing all the refuse from the streets, as the bullocks are able to make two short trips in a morning, but could not go more than once to a distant rubbish depôt. A tramway that would carry all the rubbish to a considerable distance would be a great boon to the municipality. The present establishment of carts would then be ample for the thorough conservancy of the streets.

The drainage is probably the worst feature of the Madras municipality, and is directly or indirectly the principal cause of the heavy mortality, directly from the foul gases emanating from them and pervading the houses built close to them, and indirectly through the sewage percolating into the wells, the water of which is still largely used in some parts of the town. In many cases it is impossible to keep the drains properly cleaned, in consequence of the want of fall or of flushing pipes, and when the wooden hoe is pushed through them to carry down the refuse and silt much foul matter is still left coating the sides. The question of a drainage system for Madras that shall remedy the present evils is too large to enter upon here, and belongs rather to the province of the engineer than the sanitarian.

The year 1890 was marked by a radical change in the system of obtaining bullocks, carts, and labour. The supply of bullocks and labour was formerly made by one contractor, and that of carts by another contractor. The difficulties and irregularities that arose from the divided responsibility have been pointed out in previous reports. To remedy these evils, the present system of contracting for the supply of bullocks, drivers, and carts for one or more depôts from one and the same contractor was introduced in April 1890, in pursuance of a resolution of the Commissioners. At the same time the conservancy coolies, who had previously been supplied by contractors, were entertained and paid for departmentally. This system has been found to work much better than the former one, and as the coolies are now engaged, punished, and dismissed directly by the municipality, they are rather more regular in their attendance and more careful in their work and behaviour.

Vaccination. The total number of persons vaccinated during the year 1890–91 was 24,768 against 24,502 in 1889–90, showing an excess of 266. Out of the 24,768 cases, 24,085 were successful, 315 unsuccessful, and 368 unknown. The increase was chiefly due to the satisfactory manner in which the unprotected fishermen of Cassimode and Thondiarpett Coopums, &c. were vaccinated at the Monegar Choultry depôt during the year, instead of at their own huts, as was done in the former year by taking inoculated calves from door to door.

Year.	Total vaccinated.	Compared with the preceding Year.		Successfully vaccinated.	Percentage of success.
		Increase.	Decrease.		
1889–90 - - -	24,502	—	—	23,504	95·92
1890–91 - - -	24,768	266	—	24,085	97·24

The percentage of successful cases during the year was 97·24 as against 95·92 in 1889–90, and while there has been an increase in the proportion of cases successfully vaccinated, there has been a decided fall both in the number of cases that proved unsuccessful and in the number of cases where the results could not be ascertained. The increase in the percentage of successful cases was mainly due to the discontinuance of operations from lymph charged in tubes in two depôts as reported last year and the substitution of calf-to-arm vaccination.

Out of 24,768 cases vaccinated, 13,614 were males and 11,154 females; 1,087 were Europeans, East Indians, and Native Christians, 2,007 Mahomedans, and 21,674 Hindus. Primary cases numbered 22,945, and re-vaccinations 1,823. Of the primary vaccinations, 22,561, or a percentage of 99·20, were successful as against 97·01 in 1889–90.

The number of infants vaccinated under one year of age was 15,709 as against 15,620 in 1889-90, showing a slight increase of 89 cases. Of these, 15,544, or 99·64 per cent., were successful. During the past three years, the largest number of cases vaccinated was among children under one year. Out of 24,768 cases vaccinated in 1890–91, 15,709 were infants under one year of age, 5,252 above one and under six years, and 3,807 above six years.

Of the 18,154 births registered during 1890-91, 511 cases were returned as still-born. There were 5,831 deaths from various causes under one year. Deducting these from the total births registered, it will be seen that the number of infants vaccinated under one year (15,709) is greatly in excess of the number born alive. The probable explanation of this apparent anomaly is that all the infants operated on were not born in Madras. In some cases mothers from up-country come down to Madras for their confinements and return to their native places a few months after delivery, and in other cases mothers from Madras go to the mofussil for their confinements and come back in a few months. The infants of temporary residents escape vaccination, for the mothers return to the mofussil before the expiration of six months, and it is only after infants have attained this age that compulsory vaccination is enforced. Of the 15,709 infants vaccinated under one year of age, 12,927 were reported to have been born in Madras, and the remaining 2,782, though their parents were permanent residents, were born elsewhere and subsequently brought to Madras.

The following table shows that for every 100 of the population 6·21 resort to vaccination. A large proportion of Hindus are being vaccinated year after year; in the year 1890–91, 6·98 per cent. of that class were operated on against 2·78 among Europeans, East Indians, and Native Christians, and 4·06 among Mahomedans :—

——	Europeans, East Indians, and Native Christians.	Mahomedans.	Hindus.	Total.
Under one year - - -	748	1,374	13,587	15,709
Above one and under six years -	253	422	4,577	5,252
Above six years - - -	86	211	3,510	3,807
Total - - - -	1,087	2,007	21,674	24,768
Population - - -	39,094	49,404	310,279	398,777
Percentage of vaccination to population.	2·78	4·06	6·98	6·21

During the year, 92 deaths were registered from small-pox against 66 in the previous year, showing an increase of 26 deaths. Of the 92 deaths, six occurred in hospitals and dispensaries, and the remaining 86 in private houses in the city. The disease was first imported to Madras from the adjoining districts. The disease was not confined to any particular locality, but scattered among the unprotected under six months, postponed cases above six months and under 12 years, and above 12 years. There were 12 cases under six months of age, 61 cases under 12 years, and 19 above 12 years. Immediate steps were taken in vaccinating the unprotected in the neighbourhood where cases occurred. It is gratifying to note that no deaths from small-pox occurred among fishermen during the year, owing to the unprotected having been brought under the influence of vaccination in 1889–90. 699 cases of unprotected fishermen were vaccinated in the Monegar Choultry depôt instead of at their own huts as was done last year. The Compulsory Act was put in force among the fishermen and they

were compelled to get their children vaccinated at the public depôt instead of at their own doors.

Vital statistics.

Births.—During the year 1890, the total number of births registered was 17,569, exclusive of stillborn. This shows an increase of 1,220 over the preceding year, which is probably due in part to improved registration, and in part to a steady increase in the population. The birth-rate is therefore estimated at 44 per 1,000 per annum against 40·9 last year. The fact that the rate was calculated on the Census of 1881 without any annual average addition accounts for this high figure. Of these births, 9,001 were males and 8,568 females. The number of still-births during the year was 533 against 385 in the previous year. This is considerably above the average for the decennium.

The statement of births arranged according to castes and creeds, shows that the Hindus are the most prolific race in Madras, having a ratio of 45·2 per 1,000; that the Mussalmans come second with 42·2; and the Europeans, East Indians, and Native Christians are last with a ratio of 37 per 1,000. This relative order of fertility has been maintained throughout the decennium.

Mortality.—The total number of deaths during the year was 17,194 against 17,086 of the year before, giving a ratio of 43·1 against 42·8 per 1,000 per annum. Of the different castes the heaviest death-rate, 46·1, was that of the Mussalmans, the next, 43·7, being that of the Hindus, whilst the Christians, 34, was by far the lowest. The Christians include a large number of Tinnevelly Shanars and other poor people living in crowded and unhealthy parts of the first division, so that their comparatively low death-rate cannot altogether be due to their living in the more healthy and less crowded parts of Madras. The fact that they are more favourably disposed to Europoan medical treatment has, in all probability, an appreciable effect on their death-rate. The mortality was highest from July to October, at which time cholera was prevalent in Madras.

A comparison of the relative mortality from different diseases in 1889 and 1890 shows that during the year under review the number of deaths from small-pox was rather higher than in the previous year, though still far below the average for 10 years. Under measles the number was still high, though much lower than the year before, when a serious epidemic prevailed. The numbers under fevers and under diarrhœa and dysentery are both above the average, and the mortality from cholera is considerably higher than it has usually been since the introduction of a water-supply into Madras.

Statement of Mortality from the Prevalent Diseases for 1890 *contrasted with those for* 1889.

Years.	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Total.	Other Causes.	General Total.	Ratio per 1,000.
1889	45	1,204	4,154	2,993	182	8,578	8,508	17,086	42·8
1890	78	412	4,685	2,704	744	8,623	8,571	17,194	43·1
Average of 10 previous years.	902·0	246·6	3,716·1	2,500·7	339·4	7,704·8	8,186·1	15,890·9	39·8

The following table shows the deaths that occurred during the year, classified according to age:—

Statement of Mortality according to Age.

Age.	Population.	Deaths.		Total.	Ratio per 1,000.
		Males.	Females.		
0–1	10,054	3,097	2,732	5,829	579·7
1–5	36,183	1,049	1,158	2,207	60·9
5–10	46,058	335	387	722	15·6
10–15	42,955	202	254	456	17·5
15–20	35,142	293	440	733	20·8
20–30	74,072	680	908	1,588	21·4
30–40	59,136	639	566	1,205	20·3
40–50	42,623	559	481	1,040	24·3
50–60	26,445	651	559	1,210	45·7
60 and upwards	26,109	1,009	1,195	2,204	84·4

This shows a lamentable state of things. The number of children that survived in the first year is, according to the figures, less than a half of those born. However, this is calculated on the Census of 1881. If the actual number of births during the year 1890 is taken, it is found that about two out of every three survive. Apart from bad sanitary surroundings, which are held to conduce more especially to a high infant mortality, the treatment they receive during this trying period of life must also help to raise the mortality. It is a common practice in Madras to give infants castor oil or other powerful medicines in some cases every day, in others every other day for the first six months of life, and it is questionable to what extent the dose is graduated according to the age. In the case of accidental poisoning of infants, which under the circumstances must occur to a considerable extent, no one is likely to be called in who can define the cause of death with any certainty.

Out of the total deaths, viz., 17,194, 8,514 occurred among males and 8,680 among females. In the classification according to castes the most noticeable feature is that among the East Indians, the proportion was 257 males to 194 females, whereas in the previous year the female deaths were rather more numerous than the male.

The highest comparative mortality occurred again in the fourth Division (60·5). This locality is mainly occupied by parcherries and hutting grounds inhabited by a very poor class of people. Much of the ground is low-lying and swampy; part of it is land reclaimed by the deposit of rubbish. None of the other divisions show a mortality very much above the average.

Small-pox.

One of the few bright features of a Madras Sanitary Report is the enormous reduction in the mortality from this disease, brought about by the introduction of vaccination, and still further by making it compulsory. This has been so fully shown that it is unnecessary to give the figures again. The number of deaths that occur is now so small that any comparison between the different castes is practically valueless. Moreover, the reports received by the Municipal Office show that a very large proportion of the cases that end fatally occur amongst unprotected people from surrounding districts, who come up to Madras after contracting the disease, which has a long period of incubation, and develop the outward manifestations after their arrival.

Measles.

The continued heavy mortality under this head, though considerably less than that of the previous year, is still worthy of note, seeing that the disease itself rarely proves fatal. The principal danger is from diseases of the respiratory organs brought on by chills. The custom prevalent amongst most of the natives of Madras of leaving their sick almost entirely without covering no doubt conduces to this heavy mortality. The fact that measles occurs so largely in the slums of Madras and seldom in the healthier localities is remarkable, as in Europe it apparently attacks all classes of the community indiscriminately.

Cholera.

During the year 1890 Madras was visited by an epidemic of cholera severer than any in the decennium with the exception of 1884. The total number of deaths from this cause was 744, the average of the 10 previous years being 339·4, the highest number being 1,193 in 1884, and the lowest number being 2 in 1880 and 4 in 1886.

The epidemic commenced in the month of July, when 39 deaths were registered. The disease was in the first instance imported from Pariapalium, a place of annual pilgrimage largely resorted to by certain classes of the Hindu population. It made its first appearance in the Fishermen's Kuppum in Royapuram, and quickly spread through the Tinnevelly settlement, one of the most crowded and insanitary parts of Madras, inhabited chiefly by paddy-boilers. The stagnant ditch drains of that part of the town are full of sewage mixed with paddy-water, which forms an excellent organic infusion for the development of the germs of a disease. The epidemic seems to have then spread over the whole of Madras, and not a single district entirely escaped its ravages. The disease having once got a footing in Madras spread rapidly. The season favoured its development, as the ground was constantly moistened by showers, and there was a noticeable absence of wind. In August the monthly mortality reached its maximum of 333. After this it gradually diminished, 242 deaths being registered in September and 100 in October, when the north-east monsoon finally put an end to the epidemic. The highest number of deaths from cholera occurred amongst the Hindus, but the highest ratio amongst Mussalmans and East Indians.

On the occurrence of the outbreak, precautionary measures were at once adopted. Extra staff were engaged to maintain the cleanliness of the diseased areas, disinfect

the huts and houses, burn the contaminated clothes and bedding and administer medicine and nutriment to the sick. A number of suspected wells were closed and the people were strongly advised to drink Redhills water. Cholera sheds were also erected in connexion with the principal hospitals, in order that the cases might, as far as possible, be segregated.

Fevers.

During the year the mortality under this head amounted to 4,685 against 4,154 of the previous year. It is impossible to estimate the proportion of these deaths due to typhoid or malaria. By far the greater proportion of people in Madras do not avail themselves of skilled medical aid, and from the accounts given at the Registration Offices the most subtle physician would fail to discriminate all the various diseases, which the Registrar, for want of more accurate information, enters as fevers.

Bowel complaints.

The mortality under bowel complaints, which include diarrhœa and dysentery, shows a slight improvement on the previous year, being 2,704 against 2,993.

ABSTRACT OF REPORT OF THE MUNICIPAL COMMISSIONER FOR THE CITY OF BOMBAY FOR 1890-91.

(*Mr. H. A. Acworth.*)

Drainage.—The engines at the Love Grove pumping station were worked on the whole, though at an enormous expenditure of coal, satisfactorily, and were frequently all required. Attention was given to determining the actual effective work done. A Committee of the Corporation was appointed to report upon the efficiency of the machinery, but at the close of the year their report had not been submitted. The working of the Carnac Bunder night-soil pumping station and of the several drainage sluices was also satisfactory. Public works.

Tenders were again invited for the work in house connexions of the first portion of the drainage scheme, but none were received. The work in house connexions of the Agripada District has been entrusted to Mr. Sittaram Luximon, and satisfactory progress is being made.

Mr. Baldwin Latham in his report on the sanitation of Bombay, which was printed and circulated in July 1890, proposes to have the main sewer outfall at Colaba. As an alternative he proposes improvements in the present outfall at Worli. Government appointed a committee to consider these proposals, but their orders on the committee's report have not been yet received. Until the future position of the outfall is determined, no serious or comprehensive effort can be made to extend and complete the sewerage system upon the lines suggested by Mr. Latham.

Several new latrines and urinals have been erected, and miscellaneous drainage works, such as repairs to drains, cleaning of drains, and flushing of sewers and drains, &c., has been well done. The Commissioner endorses the opinion of the Executive Engineer that the municipality has suffered a great loss in the death of Mr. A. Baker, the late Chief Inspector of Drains.

Tansa.—The dam works were practically completed at the end of the year. The total quantity of masonry work executed is 11,000,000 cubic feet, of which 3,490,436 cubic feet is the outturn for the year under report. At the commencement of the year (1st April 1890) the water in the lake stood at R. L. 354·75. At the end of the monsoon it stood at R. L. 380·36, and this gave a depth of 90·36 feet against the water-face of the dam in the bed of the river. At the end of the year (31st March 1891) the water stood at R. L. 378·51, or 1·49 feet below the sill of the lowest outlet sluices. The rainfall gauged at the dam site gave a total of 105·93 inches. The average of the previous five years was 103·33. Waterworks.

Duct Works.—The total length of tunnel driven is 21,000 lin. feet, of which 7,230 lin. feet was done during the year. A balance of 900 lin. feet remained to be done. The masonry conduits, aggregating about 23 miles, have been nearly completed, only a few gaps remaining to be done. The laying of the 48″ pipe on all the syphon tracks (with the exception of syphon No. 1, where the pipes had not been delivered) are approaching completion. All the pipes required for the project, excepting a small number of special castings, have been tested and passed at home. The number to be delivered is small, and they would have been delivered before this had they been required.

All the land for the lake and almost all for the duct up to the boundary of the island of Bombay has been acquired.

Revised estimates for the whole of the Tansa Waterworks Scheme were sanctioned by the Corporation on the 5th February 1891. The total is now Rs. 1,47,00,000 against the original estimate of Rs. 1,23,00,000, or an increase of 24 lakhs.

Vehar.—The rainfall for the year was a very favourable one, viz., 100·04 inches, the average of previous years being 81·57 inches. This favourable rainfall, combined with the overflow from Tulsi Lake, and of the supplementary supply from Pawai, resulted in the level of the water in the Vehar Lake being 7 feet higher on the 31st October 1890 than it was on the 31st October 1889, the respective levels being 262·35 and 255·40. The point of overflow, 262·50, was reached on the 29th and

30th September 1890, but the overflow never actually commenced, and the level gradually receded. No work of importance was required during the year; but the preservation of the sanitary condition of the lake and its gathering ground has received strict attention.

Pawai.—The Pawai works were completed before the monsoon of 1890, and the pumping-engines were worked during the monsoon with satisfactory results. The rainfall was 94·33 inches, or about five per cent. less than Vehar.

Tulsi.—The rainfall was 116·09 inches, being the heaviest yet recorded. The lake overflowed on the 2nd August. The dam and catch-water channels are in a satisfactory condition, but a portion of the pipe line crossing the Bandra creek was under repair.

Bhundarwada Reservoir.—Works to reduce the leakage of the reservoir were undertaken. The floor of filter No. 1 and the floors and walls of the inlet and clear-water channels were repaired with Indian patent stone, and the work has been completely successful.

Malabar Hill Reservoir.—Several improvements, costing over Rs. 80,000, were effected, the most important one being the asphalte flooring to the settling basin. Another important improvement was the fixing of a 25-inch diameter turbine in the outlet well on the outlet main supplying the city, in order to supply the high-level district. The total length of new mains laid during the year was about 28,000 feet and the renewal of old mains 6,115 feet. The number of free supplies, dipping wells, drinking fountains, &c., was, on the 31st March 1891, 174. The increase in water connexions was 736, bringing the total number up to 17,634.

Public health.

During the year under review the state of the public health has been better than in the preceding year. The total number of deaths from all causes amounted to 20,534, being a decrease of 2,844 in the number of the previous year. The average number of deaths for the last five years is 21,384. The returns of mortality from the chief death-causes show a decrease in small-pox, measles, fevers, cholera, diseases of the respiratory system, diarrhœa and dysentery, and an increase in phthisis, diseases of the nervous system, and accidents. The enhanced mortality of the city during the first quarter of the year was due to the influence of an epidemic of influenza, which acquired intensity in the latter part of February.

Amongst all the great classes of the population there is a reduction in the mortality, the death-rate per 1,000 being, Europeans 18·56, Native Christians 19·31, Parsis 21·09, Brahmins 22·27, and the great mass of the Hindu population 23·90.

The sections of the city in which the highest mortality occurred were: 1st, Parel (which has had the highest mortality for the two previous years); 2nd, 2nd Nagpada; and 3rd, Byculla. It should be noted that in these sections there is either imperfect drainage or no drainage at all.

The number of deaths from cholera was 102 against 462 in the previous year. There were 2 deaths of Europeans, 9 of Parsis and 9 of Hindu low-castes, or a mortality in each case of ·18. The death-rate was greatest in Girgaum, Kamathipura, Chowpatty and Bhuleshwar.

There were 150 deaths from small-pox against 304 in the preceding year, and these occurred chiefly amongst Hindu out-castes, Native Christians and the mass of the Hindu population. The death-rate was greatest in the districts of Parel and Mahaluxmi.

The deaths from measles were 179 against 459 in the previous year. The highest mortality was amongst Hindu out-castes, which class had the highest mortality last year also. The death-rate was greatest in the districts of Tardeo, Byculla, and Girgaum.

The deaths from fever were 6,489 against 7,266 in the previous year. The death-rate was greatest in the districts of Parel, Byculla, and Mahaluxmi. The Committee of the Corporation, appointed on the 28th November 1889, to consider the subject of the increasing numbers of deaths from fever, submitted its report during the year. The Committee attribute the causes to (1) imperfect drainage, (2) absence of drainage, (3) imperfect conservancy, (4) street nuisances, (5) bad state of private lanes, (6) overcrowding, (7) milch cattle stables, (8) disposal of town-sweepings on the flats.

The increasing number of cesspools in certain districts, particularly those of Colaba and Malabar Hill, is becoming a serious nuisance. In the absence of drainage in these districts the cesspools are a necessity, and the removal of their contents is a severe tax upon the Health Department. The only remedy is the construction of drains, for it is impossible to remove in carts all the water brought into the cesspools through pipes.

The hospital at Grant Road was open during the whole year for the treatment of epidemic cases of disease.

The question of burial places for the dead, particularly of the Beni-Israel and Mahomedan dead, formed the subject of a report of a Committee of the Corporation. Negotiations for the purchase of land for a burial ground have been in progress, but nothing is definitely settled.

The bill dealing with the adulteration of Ghee was not proceeded with by the Bombay Government, as the Government of India declined to accord sanction to certain sections of it.

The number of births registered (exclusive of still-born) was 15,568 against 15,493 in the previous year. Contrasted with the number of deaths (20,534), but one inference can be drawn, viz., that the registration is inaccurate.

On an average, 4,129 men and women, 788 scavengering and drain carts, and 166 night-soil and cesspool carts were employed daily. The collection of garbage or cutchra was 309,482 tons, equal to 847 tons a day. 131,836 tons of night-soil, equal to 361 tons a day, were collected and removed; and 192 miles of covered drains were opened and cleaned.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF BOMBAY FOR 1890.

(*Dr. T. S. Weir.*)

The abnormal conditions of a scanty rainfall in 1888 and 1889 were accompanied by unfavourable conditions of the public health and an increased mortality in the beginning of 1889, and an increasing number of stranger immigrants and a high fatality amongst these strangers.

	Number of Deaths.		
	1888.	1889.	1890.
Born in Bombay - - -	11,154	11,128	10,041
Strangers - - -	11,063	12,071	10,340
Unknown - - - -	204	179	153

The influence of abnormal conditions of season on the public health I have had frequently to examine, and in the past year a scanty rainfall in the season before excited apprehensions of a water-famine in this city, and to prevent that calamity a dam was built at Pawai, and a new supply of water, now called the Pawai, formed. The quality of this new water-supply I had to give an opinion on. The question was practically this:—Was it better to drink a water not very impure and to save the water in Vehar and Tulsi Lakes for the hot season, or to drink afterwards in the hot season water from Vehar and Tulsi—very impure?

Towards the end of August I was of opinion that the water could safely be delivered. The results of examinations of the filtered water were good. Even if the water had been more impure so great was the necessity of the Vehar Lake being well filled before the end of the monsoon, I should have recommended its use. Pawai water was four times more pure than Tulsi when Tulsi was first used, and it was even more pure than Vehar had been during the last hot season. It was of the greatest importance to the public health that the Vehar supply should be improved, and it could be improved by allowing the lake to fill and by using at this season Pawai water, when Pawai water can most safely be used. On the 10th September, as the water in the Pawai Lake was less, and as I noticed an increase in the vegetable matter suspended in the water, I recommended that the distribution of unfiltered Pawai water be stopped and that Vehar water be again distributed.

The question at that time was simply this: Was it better to drink Pawai water as good as Vehar and better than Tulsi than to drink more impure, even dangerously impure, Vehar and Tulsi water in the next year? The result has shown that the opinion you came to was right and the best opinion in the interests of the public.

From absence of drainage the position of Malabar Hill is very serious. The population has increased very much. So long as the population was scattered the absence of drainage was not observed and it did not cause serious nuisances, but now that buildings are close serious nuisances have arisen from cesspools and these nuisances cannot be abated. The population is now much greater than in 1881, and yet for an increasing population, drainage to remove the liquid refuse and to remove the water brought in pipes has not been constructed. By Malabar Hill I refer to Walkeshwar—for so the registration district of Malabar Hill is called. To remove the liquid refuse from cesspools the following establishment is given:—

Carts - - - - - -	5
Bhungees - - - -	21

I need scarcely say that this establishment cannot remove every day all the liquid refuse and water distributed to a population estimated in 1881 to be 11,303. Some of the residents wish that the cesspools of their residences should be cleaned every day, and others object to any portion of the refuse being used for watering the gardens. It appears to me that the time has come when the residents must be distinctly told that the cesspools cannot be cleaned every day. The amount of cleaning necessary may be

taken as the amount of water delivered minus the amount lost in waste. The establishment given can only remove a portion of this refuse. Moreover, I look on the removal of all liquid matters by carts and by hand as impracticable. The only practical solution is the construction of drains for the removal of the liquid refuse now received and collected in cesspools.. As the completion of a drainage system will in any case take time, I suggest that the storm-water channels be cemented and used as drains.

Section 393 of the Bombay Municipal Act enacts that "no person shall, without the "written permission of the Commissioner, use or employ in any factory or any other "place any steam-whistle or steam-trumpet for the purpose of summoning or dismiss-"ing workmen or persons employed." A great and serious nuisance has been caused for years by the steam-whistles used in mills. It never seemed to me right that in mills, more than in any other places where labour was employed, steam-whistles should be used to call labourers to work. The first point that had to be ascertained was as to whether steam-whistles were necessary, and inquiries were commenced, and we ascertained that a number of mills—of very large mills, too—did not use steam-whistles but used bells, and we also ascertained that some mills commenced to whistle and to disturb the night by 4 o'clock. There are steam-whistles and steam-whistles, the soft-toned ones might perhaps have been suffered, but others, in shrillest and most discordant screams, startling the night, startling the sleeping, when sleep is soundest, were an intolerable nuisance. Some of these steam-whistles could be heard from one side of the island to the other. The comfort of people living near the mills was seriously affected, while the repose of the whole city was disturbed by sudden screams and blasts, let forth to cause the greatest disturbance. I proposed the following conditions in giving permission to use steam-whistles :—

1st. The whistle or trumpet shall not be used before the hour of 5.30 o'clock a.m. for the purpose of summoning workpeople.

2nd. It may be used to intimate the interval during the day allowed for meals, but only if the whole of the machinery is stopped.

3rd. It may be used to intimate the hour of dismissal of workpeople and stoppage of the machinery in the evening at any hour not later than 6.30 o'clock p.m.

4th. The period of sound shall in no case exceed 10 seconds.

I now proceed to examine the incidence of the mortality. The deaths by place of birth approximate more closely than in 1889. 10,041 were born in Bombay and 10,340 elsewhere. We observe under epidemic febrile influences an increase of deaths both amongst Bombay-born and strangers in March, and a fall in April. In March the deaths amongst Bombay-born rose to 450 and amongst strangers to 460.

Analysing the mortality by the chief death causes, we observe a decrease from small-pox, measles, cholera, diseases of the respiratory system, diarrhœa, dysentery, and an increase from fevers, phthisis, diseases of the nervous system, and accidents; therefore, notwithstanding an epidemic of influenza, the mortality from the chief death causes has been less than in the year before, and the public health has been better. This could scarcely have been anticipated in the week ending 11th March, when the death-rate rose to 38·45.

Return showing the Number of Deaths from Different Causes in 1890.

Causes of Deaths.	Number of Deaths.	Rate per 1,000 of Population.	Remarks.
Small-pox	150	·18	These calculations are based on the approximate Census Returns of 1891.
Measles	179	·22	
Fever	6,489	8·01	
Cholera	102	·12	
Phthisis	2,728	3·37	
Diseases of the Nervous System	1,936	2·39	
„ Respiratory System	3,335	4·12	
Diarrhœa	905	1·12	
Dysentery	507	·63	
Accidents	397	·49	
All other causes except Still-born	3,806	4·70	
Total	20,534	25·35	

As in the previous year, the mortality of male children under one year is higher than of females; while from one to four the mortality of females is higher; from five to 40

more females than males died. During the nubile period, between 12 to 40, the female mortality is 6·5 higher than the male. The high female death-rate at these periods is suggestive.

The mortality of children under one year of age (262·45) is 28·7 less than in 1889, and over one year and up to five years 50·3 less. The total mortality under five years of age is 17·08 less than in the last year. This indicates improved conditions. The proportion of deaths under one year of age to births is 4·38 less than in the last year.

Amongst all the great classes of the population there is a reduction of mortality; the lowest mortality is registered amongst Europeans, 18·56; then follow Native Christians, with a mortality of 19·31; Parsees, 21·11; and Brahmins, 22·27. These are very low death-rates. The mortality of the great mass of the Hindoo population is as low as 23·89.

Mortality by Districts.—The section of highest mortality is Parel (52·58 per 1,000), The section of highest mortality in the two previous years was also Parel; a district on the south of Parel (Byculla) has the third highest mortality (40·75); and a district adjoining it (2nd Nagpada) has the second highest mortality (47·48). In these three districts we have conditions that lead to common results,—impurity of the soil and air, foulness from imperfect drainage and absence of drainage. There has been in Parel and Byculla a great expansion of population, but when that expansion has been estimated, it will still be found that there is in these districts, in these suburbs, open and even yet, except in groups, not crowded, having much open ground, a great loss of life—a great excess of mortality, which should not and need not be. In Parel and Byculla nuisances from pools of sewage, where there are no drains, or where there are drains but no connexions made, poison the air and soil and offend the senses,—pollutions amidst dwellings and around the district, pools of sewage polluting ground and air and oozing to lowest levels. Outside the wall of the ground set apart for the Small-pox Hospital water, sewage laden, flows from chawls newly built. One portion of Byculla(Agripada), a new town, sewage from the buildings flows to the lanes and from the lanes to lower ground and to ditches. The condition of Parel and Byculla is but the condition of all the suburbs, lamentable as it is. Even within sight of the Municipal Office there is a street (the Colaba Causeway) which has no drains, and all the drainage and all the water brought in pipes has to flow into cesspools and to pollute the ground, for it is hopeless to attempt to remove in carts all the water brought in pipes; further north, near the Chinchpoogly station, there is a ditch of sewage, which I described in the last annual report; that ditch is still festering and corrupting; further north, by the side of the Tulsi water-pipe, a pond of sewage from a mill; to the east, horrible collections and pools of sewage; from Ghorapdeo, where sewage has much abounded, oozing to lower levels—trenches in positions of most offensiveness had to be dug by the Health Department and by the side of the public street—sewage has to be lifted in buckets from side trench to side trench, or the public road will be flooded.

The mortality also indicates the conditions in each district hostile to health. We have in each section a mortality from diarrhœa about twice the general fatality for the whole city, and we have in each section a mortality from fevers ascending from 10·11 in 2nd Nagpada to 20·85 in Parel—far over the general rate for the city. We have a difference in the types and incidence of fatality as we have different developments of insanitary conditions in each section. In 2nd Nagpada, where we have the greatest house-crowding, as many as 67·18 persons collected in—15 families to each house—each crowded dwelling, we have a mortality from phthisis more than twice the mortality in Byculla—nearly twice the mortality in Parel, and more than twice the average mortality in all the other sections of the city, and a fatality from diseases of the respiratory system twice the fatality in the whole city. In 2nd Nagpada the pressure of population is greater than in the most crowded and dense section of London. The extreme pressure in London is 222 persons to an acre, whereas in 2nd Nagpada it rises to 469. In Nagpada we have a population in densest aggregation and imperfect drainage underneath the ground, such as we have in most of the old portions of the city built by waterways and channels rudely constructed and now built over.

Measles. The mortality from measles is favourable, and much below the average; 179 deaths were registered, being 459 less than in the year before, and 295 less than the average. As in former years, females have suffered more than males; the same order has been observed in the fatality from small-pox. The female death-rate is ·28, and the male ·19; the excess of female mortality in 1889 and 1890 being ·39. The incidence of measles follows the seasonal periods, influencing small-pox. The highest mortality occurred within the first two years of life, the mortality of males being 3·21, and females, 2·62.

From small-pox 150 deaths occurred, being 154 less than in the year before, and 44 less than the average. The disease cannot be considered to have been epidemic. The classes amongst whom the highest mortality occurred are Hindoo out-castes, Native Christians, and the mass of the Hindoo population. Amongst Eurasians, Jews, Bhatias, Chinese, and Lingaets no deaths from small-pox occurred. In 1889, when small-pox was epidemic, the highest mortality occurred amongst Native Christians, and it was ascribed to the immigration of unvaccinated Native Christians from Goa, and the relatively large number of deaths amongst Native Christians this year is due to the same cause. Small-pox.

The highest mortality occurred in Parel, 19 deaths, equal to a mortality of 1·02. Mahaluxmee, a district in which the population has greatly expanded, had the next highest mortality to Parel, six deaths, giving a death-rate of ·96; in upper Colaba, Esplanade, Walkeshwar, Tarwaree and Mahim, no deaths from small-pox occurred.

From cholera, 102 deaths were registered, being 360 less than in the last year, and 243 less than the average; 134 cases were reported, and 102 ended fatally, giving a mortality of 76 per cent. Cholera cannot be considered to have been epidemic during 1890. Most of the deaths occurred in January, February, and July. Of the 134 cases, 87 were males and 47 females. The percentage of deaths to attacks being 73·5 amongst males and 80·8 amongst females. Cholera.

As in previous years, the population not born in Bombay suffered most, and most influenced the mortality. The influence of the immigrant population has been observed in former years, and in this year 110 out of the total 134 cases were born outside of Bombay. The following table is of interest:—

For 1890.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Bombay - - -	22	16	72·7
Elsewhere - -	110	85	77·2
Unknown - - -	2	1	50·0

If the cases are grouped according to period of residence, it is found that 47 of the cases, 38 of which proved fatal, had not been six months in this city:—

Duration of Residence in Bombay.	Attacks.	Deaths.
Under 3 months - - -	31	26
Under 6 months - - -	16	12

Of the cases, 113 occurred amongst persons who habitually used Vehar and Tulsi water. Although the number of persons who used well-water are few, the mortality, as in former years, is higher than amongst persons who used Vehar and Tulsi water.

For 1890.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Vehar and Tulsi water consumers -	113	89	78·7
Well-water drinkers - - -	6	5	83·3
Unknown - - - -	15	8	53·3

The highest mortality, as in the last year, occurred in Girgaum (0·55); Kamateepoora (0.38), a district in which cholera has not generally been prevalent, had the next highest mortality; and then follow Chawpatty (0·27), and Bhuleshwar (0·26) in order of incidence. I hope for a reduction of mortality in Girgaum generally, as there has been through drainage and sanitary work a reduction of mortality in localised portions of this district, where cholera was once endemic. In Girgaum, as in the other portions of the city, where buildings have been improved and more opulent classes attracted, and cesspools removed and drains constructed, fewer cases of cholera occur. In "wadies," where once epidemics were expected every year, and preparations made for them, cases seldom now occur, and when they occur others do not follow. That which I may describe as epidemic attraction has ceased.

Fevers. The mortality from fevers is equal to 8·01 against 7·99 last year, notwithstanding an epidemic of influenza and the influence which that epidemic exercised on the mortality, increasing the deaths in March to the unusual number of 994. The total mortality from fevers (6,489) is 777 less than in the year before, and only 91 more than the average—the average including a period of exceptionally low mortality. Of the total deaths from fevers 55 per cent. occurred in the first six months, the greatest number being in March, following on a low mortality in February, and the lowest number in November.

Of the total deaths from fevers 5,363 were referred to remittent fever, being 214 less than in the last year, and 478 more than the mean of the preceding five years; 315 were ascribed to ague, being 90 less than in the last year, and 61 more than the average; 794 were referred to simple continued fever, being 465 less than in the last year. and 449 less than the average; 17 were registered from enteric fever, being 8 less than in the preceding year, and one more than the average.

Taking the figures of the Census of 1881, the highest mortality occurred in Parel (20·85); this high mortality, although ·64 less than in 1889, is in some measure due to expansion of population, for there has been a great increase of population in Parel, and it is also in some degree influenced by insanitary conditions from imperfect drainage and absence of drainage. The mortality in Mahaluxmee (12·03) is chiefly ascribable to increase of population. The sections, out of the total 32, in which the mortality is above the mean for the whole city are, Parel, Byculla, Mahalukshmi, Kamathipura, Khara Talao, Chuckla, 2nd Nagpada, Sewri, 1st Nagpada, Umercary, and Mazagon.

The highest mortality by class occurred amongst a small and fluctuating community, the Negro-Africans (33·38); the second highest mortality amongst Jains (18·17); and the third highest amongst Eurasians (14·55). It is probable that these three classes have increased very much, and that the fatality from fevers has not fallen so heavily on them as the returns show. The classes amongst whom the mortality rose highest in March were Jains, Brahmins, and Native Christians, and the classes least affected were Europeans and Parsis. There is one class living in hut and in crowded chawl and in crowded room, generally on ground floors and in dampest localities, which suffers most and is most stricken by febrile affections—Hindoo out-castes. The community amongst whom the lowest mortality has occurred are Europeans (1·43); the mortality amongst Europeans is much below the average, and between Europeans and the classes having a mean death ratio we find the Parsi community with a low death-rate of 5·53, and Jews being the next lowest with a mortality of 6·92.

Phthisis. From phthisis 2,728 deaths were registered. The mortality is 77 less than in the last year, and 34 less than the average. The mortality is highest, as in the four years before in the same district—2nd Nagpada (8·92)—the district whose condition and whose house-crowding, the densest in Bombay, I have before in this report described.

Respiratory system. From diseases of the respiratory system, 3,335 deaths were registered, being 607 less than in the last year, and 571 less than the average. Of the deaths from diseases of the respiratory system 2,008 were referred to bronchitis, being 438 less than in the last year, and 24 less than the average; 806 to pneumonia, being 8 more than in the last year, and 25 less than the average.

Births. During the year 15,568 living and 1,282 still-born births were registered. Of the living births, 7,965 were males and 7,603 were females, giving a proportion of 104·76 males to 100 females. Assuming that there were 100 females to 100 males, the corrected birth-rate would be equal to 30·33.

APPENDIX.

No. 1.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER with the GOVERNMENT OF INDIA for 1890.

Delay in Receipt of Report.—This Report did not reach us till the 15th of June, or nearly 18 months after the close of the year to which it refers. We are well aware of the difficulty of obtaining the data necessary for its preparation, from the many sources from which they are drawn, on the exact dates prescribed for their submission, and how the want of punctuality on the part of even one individual may retard the completion of the general statistics. We are also aware that not unfrequently returns have to be sent back for correction or for explanation on certain points, and that reports also have to be amplified or amended when the information originally furnished has been incomplete, or seemingly inaccurate. We do not under-estimate these difficulties as causes of delay, which are constantly recurring, and which it is not always easy promptly to overcome. We would merely point out that the sanitary history of the year loses much of its interest and practical importance by being so long deferred, and would express a hope that it may in future be found possible to have it ready within 12 months after the close of the year to which it refers.

2. *European Troops.—General Results.*—With the exception of the epidemic of influenza, to which particular reference will be made hereafter, the year was generally healthy. Owing chiefly to this cause there was some increase in sickness, whether judged by the admissions into hospital or by the proportion constantly in hospital, but there was a considerable diminution in the death-rate. The results among European troops in the three Presidencies are shown in the following statement, to which have also been added the separate statistics of Quetta and Burma:—

European Troops.

	Strength.	Ratios per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
India	67,823	1,520	87	13·84	25	39
Bengal	41,353	1,584	89	15·50	25	41
Madras	13,707	1,442	91	12·84	23	36
Bombay	12,763	1,396	77	9·56	29	38
Quetta*	2,019	1,099	58	9·41	—	—
Burma†	4,712	1,743	102	20·80	—	—

* Included also in Bengal. † Included also in Madras.

Taking the statistics of the European Army in India as a whole, the results are generally favourable. With a slight increase in sickness the mortality was less than it had been since 1884. Of the three Presidencies Bombay shows the lowest ratio, both of sickness and of deaths, while under both these heads Bengal shows the highest. If the figures for 1890 in Bengal be compared with those of former years, we find that the constant sick-rate (89) is much above that of any of the preceding ten years, except 1889, when it equalled 87. For the ten-year period before that, that is to say, for the ten years 1870–79, the rate averaged only 61. In regard to mortality, the results of 1890 are more satisfactory. For 1870–79 this averaged 21 per 1,000. Since then it has fluctuated between 27·73 and 11·21; in 1890 it was 15·50. Only four of the ten years between 1879 and 1890 yielded a lower rate than 1890. In Madras the constant sick-rate (91) exhibits an even more remarkable increase when compared with former years than Bengal. In the ten years 1870–79 this rate was only 60. The death-rate, 12·84, is a marked contrast to 20·05, the ratio for 1889. Between 1870 and 1879 it averaged 17·69. As regards mortality the Bombay returns for 1890 are very favourable, not only when compared with those of the other two Presidencies in that year, but also when compared with those of the same Presidency in former years. Under both admissions and constantly sick, as may be seen in the statement above given, the rates are much under those for Bengal and Madras. The death-rate, 9·56, is very low. During the ten years 1870–79 in Bombay it averaged 15·27, and since then the minimum annual ratio has been 10·37 in 1882, varied by a maximum of 30·90 in 1880. The statistics of European troops in Quetta and Burma, which have been added to the statement, are of interest as illustrative of their experience in parts of the country which have been occupied during

recent years. In Quetta the diminution of sickness and mortality is very satisfactory. In Burma also, so far as mortality is concerned, the figures for 1890 are most favourable when compared with the two preceding years. The rates of admissions into hospital had also been considerably reduced, but there had been a rise in the constant sick-rate. For this rise in the sick-rate here and also in other parts of India venereal diseases are largely responsible, though in Burma it also seems to have been swelled by the number of men of the Chin-Lushai expedition remaining sick in the beginning of the year.

3. *Points of special Interest and Importance.*—All these and many other matters are fully discussed and illustrated in the Report, in which there are abundant statements comparing the results of 1890 with those of former years, and showing how these results have affected the different Presidencies and the different groups of stations in each Presidency, what diseases chiefly prevailed, and the extent of this prevalence as well as the proportion which each contributed to the mortality. We shall not enter into these details, which are already so clearly and fully set forth, but shall reserve our remarks in the main for a few subjects of special interest and importance. They are—

1. The epidemic of influenza with its concurrent increase in respiratory diseases;
2. The continued prevalence of venereal diseases; and
3. The continued mortality from enteric fever.

We shall deal with these questions primarily as they affected the European soldiers, but shall also take into account any information collected from the Native troops, the jails, and the general population which bears on them.

4. *The Influenza Epidemic; its prevalence among both Troops and Prisoners.*—The epidemic of influenza was certainly the most remarkable event in the sanitary history of the year. In noting on most of the Provincial Sanitary Reports for 1890, we have regretted the want of information in regard to it, because a rare opportunity seems to have been lost of observing and recording the history of the disease as it affected the people generally, and thereby accumulating a mass of evidence in respect to it which could not have failed to prove of great interest and importance. In this Report we have most valuable data regarding both troops and prisoners, all the more valuable because these are spread over such a wide area, and because the observers were all well qualified to record them. Statistics of influenza for which special tables have been introduced, are given month by month for all these bodies, and we shall now summarize them as concisely as possible in the following statement:—

Influenza among Troops and Prisoners.

—	Strength.	Monthly Number of Admissions into Hospital.												Ratio per 1,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
European Troops:														
Bengal	41,353	—	3	328	914	49	1	—	1	3	—	—	1	31·4
Madras	13,707	—	—	40	396	198	68	13	1	—	—	—	—	52·2
Bombay	12,763	—	—	105	141	1	—	—	—	—	—	—	—	19·4
Native Troops:														
Bengal	64,080	—	—	1,230	2,589	408	70	53	—	—	—	—	—	67·9
Madras	26,032	—	—	173	698	70	12	2	—	—	—	1	—	36·7
Bombay	24,032	—	8	739	1,427	—	—	—	—	—	—	—	—	90·8
Prisoners:														
Bengal	57,500	—	15	286	3,422	940	295	199	6	1	—	1	1	89·8
Madras	7,702	—	—	—	97	734	187	33	—	—	—	—	—	136·6
Bombay	7,284	—	1	56	91	32	—	—	—	—	—	—	—	24·7

We have added the strength in each case to show the large body of men who formed the field for observation. The area covered is also very large. Practically it embraces the whole of India, from the frontier in the north to the southern part of the Madras Presidency, and from the extreme west of Bombay to Burmah and Assam in the east. We have the great facts of general prevalence, though the degree of prevalence varied considerably, from 19·4 cases per 1,000 among the European troops in the Bombay Presidency to 136·8 among prisoners in Madras; of this general prevalence being confined to a limited portion of the year, commencing, with few exceptions, in the month of March, attaining its maximum in all but one instance in the month of April, and then more or less gradually disappearing altogether.

5. *Less prevalent among Women and Children.*—In the above table the wives and children of European soldiers are not entered, because it would thereby have been unduly complicated. Among them the disease was much less prevalent than among the men. The admissions equalled for women 35·6 in Madras, 15·3 for Bengal, and 9·7 for Bombay. For children the rates were 16·5 for Madras, 6·8 for Bengal, and 2·6 for Bombay. Among all of them the disease commenced in March, and among all of them, except the women in the Bombay Presidency, it attained its maximum in April. In Bombay the cases among women were confined to five in March and one in April, and among children to three in March. As a whole, the statistics of the epidemic among the women and children of European regiments in the three Presidencies correspond with those already cited regarding the men of these regiments, the Native troops, and the prisoners.

6. *Concurrent increase of Pneumonia and other Respiratory Diseases.*—As is usual when such epidemics occur, there was along with the influenza a concurrent and very marked increase in cases of pneumonia and other respiratory diseases, and this is all the more remarkable in this instance because it took place as the warmer weather was setting in, a time when such diseases are wont to decline. It is impossible to separate the cases which are to be associated more or less directly with the influenza and those which are to be attributed to ordinary causes. Even in the returns rendered by officers in medical charge of troops and prisoners perfection in statistics is not to be looked for. One observer, for example, would return a case under the head of respiratory disease which another would return as influenza, and when the epidemic commenced, as it often did, in a gradual and stealthy manner, we are told by the Sanitary Commissioner that the early cases were not unfrequently entered as cases of ordinary fever. Even as regards comparative prevalence the statistics are not to be accepted as quite exact, for it would appear that many slighter cases of influenza were treated without being admitted into hospital, and therefore were not entered in the returns. But the great facts remain as a most valuable and trustworthy record of the history of a great epidemic, and among these great facts there can be no question that along with the influenza there was a very large and concurrent increase of respiratory diseases, and especially of pneumonia, the mortality from which was much greater than in ordinary years.

7. *Geographical Distribution of the Epidemic by Groups.*—Different parts of the country were affected by the influenza in very different degree. Taking the 12 groups into which the European troops are statistically divided, we find that the Punjab suffered least. Here there were only 9·5 admissions per 1,000, whereas in the Gangetic Provinces they equalled 78·4. The next highest ratio was 52·2. It is not possible to make exact comparison between the European troops and Native troops, or between them and the prisoners, as to prevalence, for the stations occupied by the two classes of troops are not always the same, and many jails are situate where there are no troops near them, either European or Native. The statistics of the disease among both Native troops and prisoners each afford valuable data regarding the geographical distribution and relative prevalence of the epidemic, and the areas concerned may be easily ascertained on reference to the tables which detail the individual places embraced in each. The Native soldiers suffered most in Quetta. Here the cases equalled among Bombay troops 377·6, and among Bengal troops 176·5 per 1,000; not far short of this last was the ratio of 172·2 in Bengal proper and Assam. The next highest is 118·8 in in Rohilcand and Meerut. The other groups suffered but little. Among the groups of jails, Bengal proper with Assam returns 161·8, Berar 160·4, and Madras 136·6, Central Provinces 124·8, and Lower Burma 95·1 cases per 1,000. Among the others the numbers were much less, the minimum being 2·8 among the convicts in the Andaman and Nicobar islands.

8. *Geographical Distribution of the Epidemic by Stations.*—If we take the special tables devoted to the statistics of this epidemic of influenza, XXVI., of European troops, XXVI., of Native troops, and XX., of jails, much interesting and important information is to be found regarding the incidence of the disease in particular stations. To begin with the European troops, cases were recorded among them in 59 different places. In some few of these the maximum occurred in March, but in nearly all it was in April. In none of them, except at Jubbulpore, where three are entered in February, was any case returned till March. Among Native troops there is the same general culmination of the sickness in April, but there are some notable exceptions, such as Lucknow, Jubbulpore, Dharmsala, several stations in the Bombay Presidency, and three of those in Berar, in all of which the maximum was reached in March. No less than 135 jails out of a total of 249 were attacked. Of these three return the first cases in February, viz., two at Benares and one at Yerrowda, and 15 return the first cases in March, but the general prevalence was in April, though in some few it did not occur till May, rapidly dying out in all of them after that.

9. *Information regarding the Commencement of the Epidemic.*—From the statistical tables the exact date of the first appearance of the epidemic among each body of troops and prisoners cannot be ascertained, and from what we have already said it will be seen that it would have been extremely difficult to obtain this information with accuracy. On this point some details are given in the body of the Report. We learn there what is a very important fact in connexion with the history of the disease in 1890, that in August 1889 a remarkable outbreak of it had occurred in the Thayetmyo jail in Burma, where 33 prisoners were attacked, as well as some of the guard and other jail establishment. In the middle of January 1890, influenza was reported to be prevalent in Jalaun, and in Bijnor from February. Both of these are districts of the North-Western Provinces. The Sanitary Commissioner writes that "the first Europeans garrisons to *return* cases were Jubbulpore (week ending "28th February), Lucknow, Umballa, and Mhow (week ending 7th March), and the last those of "Burma, viz., Rangoon, Thayetmyo (week ending 9th May), Mandalay (week ending 6th June), "Bernardmyo (week ending 8th August)." It would, no doubt, have taken up much space to give the *weekly* admissions from influenza during the epidemic time, but such a statement would have been of great value, and would perhaps have helped to show how far they were governed by some general laws.

10. *Epidemic attributed by some to Importation.*—As to the origin of the epidemic, the opinions of the medical officers seem to incline to the theory of importation, and some of those who are quoted express themselves very decidedly on this point. There is, however, a great want of evidence to substantiate this conclusion. The mere assertion that the disease was imported, without any facts in support of it, is of little value. The mere fact that a person from a place where influenza was prevailing was the first to be attacked after his arrival in another place, and that thereafter the residents suffered is no evidence that the new comer was the agent in spreading the disease. Many

more details are required. We see no mention in the Report of attendants on the sick having suffered in larger proportion than other members of the community. The facts regarding them would have been useful in arriving at a sound conclusion in respect of the doctrine of importation. Other medical officers speak more guardedly and say that the new comers had "probably" been the means of introducing the disease, but mere conjectures do not aid in the settlement of this question.

11. *The General Conclusions which seem to be warranted by the Facts.*—What was the cause or causes of this great epidemic of influenza we are unable to say, but, on a consideration of all the facts, so far as they have been placed on record, there seems to be certain general conclusions which are self-evident. We can only judge of the causes by the results, and, judging from these results, we conclude:—

(1.) That in August 1889, causes which are not commonly present in India, at least not in sufficient force to give rise to any marked effect, were at work at Thayetmyo and produced the remarkable outbreak to which reference has been already made.
(2.) That in the early months of 1890 similar causes were operating very widely over India.
(3.) That these causes were not present in the same force in all parts, but that they varied in intensity in different localities and among different communities.
(4.) That over great part of India these causes were in maximum force during the month of April.
(5.) That thereafter they began to decline and in most parts speedily disappeared, but that the occurrence of a few isolated cases in the later months of the year indicated that they were still present here and there, though in a very minor degree.
(6.) That the disappearance of the influenza, like that of all other epidemics, is a feature in its history which demands explanation just as much as its appearance or prevalence.
(7.) That where, as in this instance, great and widely spread forces were at work producing disease, the only practical measures which can be taken to resist them lie in the improvement of local conditions.

12. *Continued Prevalence of Venereal Disease.*—The continued and, indeed, further increased prevalence of veneral diseases is a matter for great regret. In 1889, the admissions under this head reached the ratio of 48·2 per 1,000 throughout the European army of India—the highest ratio which had then been attained. The statistics of 1890 unfortunately show a higher ratio still—a ratio of 504 per 1,000. Thirty-three per cent. of all admissions were directly due to venereal diseases, and to the same cause are ascribed ·7 per cent. of the deaths and 13·2 per cent. of the invaliding. In all three Presidencies there was an increase over the returns of 1889, and there was also an increase under every form of disease, except primary syphilis. The comparison which the Sanitary Commissioner draws between the results of 1884, when lock hospitals were in force, and the last two years during which they have been given, is very much in favour of 1884. The figures stand thus:—

Admissions into Hospital per 1,000.

	1884.	1889.	1890.
Primary syphilis - -	90·2	225·1	220·7
Secondary syphilis - -	24·4	51·2	66·3
Gonorrhœa, &c. - -	179·0	205·2	216·6
Total - -	293·6	481·5	503·5

A similar tale is told if the figures for each Presidency be taken separately. In our memorandum on the Report of the Sanitary Commissioners with the Government of India for 1889, we stated the reasons which induced us to believe that the lamentable increase of venereal diseases among European soldiers in India of late years could not be explained merely by the closing of the lock hospitals. Whatever may be the cause or causes which have produced this result, nothing could well be more unsatisfactory than the state of things depicted in this Report as existing in 1890. In the European army, as a whole, no less than 34,152 cases of venereal disease were treated during that year, or considerably more than all the cases of malarial and other fevers put together. Turning to Table XXVII. of European troops, at the end of the volume, we find the details of admissions from venereal diseases by stations. In not a few of these the ratio exceeded 700 per 1,000. Among any considerable body of men, such as is sufficient for statistical comparison, the maximum seems to have been reached at Ahmednagar, where it attained to the proportion of 973 admissions per 1,000. In respect of venereal diseases, the contrast between European and Native troops is very striking. In the whole Native army, the cases of venereal diseases amounted only to 5,244, or 41·1 per 1,000 of strength. Among European soldiers, as already shown, they equalled 504 per 1,000. Out of every 100 admissions into hospital among Europeans, 33·12 were from venereal disease; among Native troops the proportion was 3·61. The Sanitary Commissioner makes no mention of the voluntary hospitals which were to take the place of the cantonment lock hospitals, and by which it was hoped that some good might have been done. The only information we have regarding them is contained in a "Report on Voluntary Venereal Hospitals in the Punjab for the year 1890." From this Report we gather that such hospitals had not been open in all of the cantonments, and that

where they were open they had not been very much made use of. On the whole, however, 431 women were admitted into them during the year, or an increase of 179 on the year previous. The Government of the Punjab is of opinion that "it is too early to form any definite conclusions as to "the value of the new system for the prevention of propagation of venereal disease, and considers "that a further trial is necessary to allow of any definite conclusions being arrived at on this point." In his future reports it is desirable that the Sanitary Commissioner should furnish full particulars regarding these hospitals in all the provinces.

13. *Continued Mortality from Enteric Fever.*—Although there was some reduction in the mortality due to enteric fever during 1890, the number of deaths ascribed to this disease is far in excess of that under any other head. Of the total of 939 deaths throughout the European army in India in 1890, no less than 333 appear as caused by enteric fever, or 35·5 per cent.; of the total death-rate of 13·84, 4·91 was due to this disease. There are two facts in its history during 1890 which deserve notice, although they are by no means new, and are, indeed, merely a repetition of former experience. The first is that it was very widely spread. On turning to Table XXIV., we find that cases were admitted into hospital in 94 different places, but that in many of them they were very few in number. As a whole the Bengal Presidency suffered very much more than either Madras or Bombay. The admission-rates for the three were 24·1, 9·3, and 10·2, while the death-rates equalled 6·26, 3·65, and 1·88. The proportion of cases that proved fatal varies so much in different cantonments as to lead to the inference either that there is no fixed rule as to what constitutes a case of enteric fever, or that the disease varies greatly in its intensity as influenced by locality or other circumstances. At Poona, out of every 100 cases treated only eight died, whereas in Fort William the percentage was 75, and between these extremes there are many intervening steps. The other great fact is that young soldiers during their early years of Indian residence are the most prone to be attacked. The experience of 1890 adds fresh evidence on this point. As regards age, the liability of men 24 and under was 65·93, between 25 and 29 it was 24·07, and between 30 and 34 only 10 per cent. As regards residence the liability was as follows, first and second years 66·47, third to fifth 19·40, sixth to tenth 14·13.

14. *Causes to which Enteric Fever is ascribed.*—This proneness of young soldiers to be attacked with enteric fever during the first portion of their Indian service is fully recognised, and is illustrated in the facts cited by many of the medical officers whose reports are quoted. One medical officer writes, "No doubt the arrival of drafts is always followed by an outbreak." Another writes, "The "station was comparatively free from enteric fever during 1890, the two main factors in India being "absent, young soldiers and new arrivals." But on a point like this the evidence of statistics collected all over India during a series of years is more valuable than the experience of any individual station, especially when that is limited to a single year. And the statistics of enteric fever among European troops in India have told the same consistent story throughout, the practical conclusion to be drawn from which is that the young soldier requires special care during his early Indian service. Many of the medical officers whose reports are quoted are of opinion that the disease is due to specific contagion contracted in the bazaar or through some indirect source; but it is satisfactory to find that, whether attributed to climatic conditions or some specific cause, the practical aim is the same, to discover what local insanitary conditions exist in each cantonment, and to have them removed.

15. *The Bacillus Typhosus.*—Attention was drawn in last year's memorandum to the discovery of the *Bacillus Typhosus* in certain Indian enteric cases. On this point some further information of interest is given in this Report for 1890. The Sanitary Commissioner writes: "Hitherto, when a "case diagnosed as enteric fever has been found on *post-mortem* examination to want the "anatomical intestinal læsions, it has simply been assumed that the diagnosis had been wrong. But "Dr. Justyn Karlinski, in Europe, has published two carefully studied cases in which the symptoms "were anomalous, and no intestinal læsions were present, and yet the bacillus was found by "cultivation from the spleen and other internal organs, and another in which, with only an old "cicatrix in the intestine, the bacilli were recovered from the blood by cultivation." This opens up a very wide field of inquiry. It shows that the *Bacillus Typhosus* is not confined to well marked cases of enteric fever, and it is therefore most important that search should be made for it in other Indian fevers, many of which it is found in practice difficult, if not impossible, to distinguish from enteric fever.

16. *Cholera.*—Although cholera was little prevalent, and added only ·72 to the mortality, the facts concerning it are of much interest. Of the 58 cases of European soldiers treated, 50 were admitted in Bengal, seven in Bombay, and only one in Madras. The 58 cases were spread over 18 stations, and over nine months of the year. Except at Lucknow, where there were 18, the attacks in any one place were few, and in many instances confined to one or two. The same remarks apply to the history of the disease among Native troops during the year, with the exceptions of Dehra Dun and Dharmsala, at both of which outbreaks of some severity took place in the month of July. The history of these outbreaks has not been given, but the general results are incorporated with those derived from all the cholera reports taken together. The localization of this disease is well illustrated by the proportion of buildings attacked out of the total number occupied. For British troops this proportion was 15 per cent., for Native troops 3·18 per cent., and for jails 24·6 per cent. The percentage of attendants on the sick who were themselves attacked, varied between 0·73 for European troops to 4·07 for Native troops. In all, out of 1,206 attendants on 673 cases of cholera, 38 were themselves attacked, but the history of even these few who were attacked is not such as to warrant the conclusion that they were attacked because they had been attending on the sick. The results of moving into camp continued to be very satisfactory. This is well illustrated by the

experience of the Goorkhas at Dharmsala. They moved into three camps. In one of these camps there were 17 cases during the first 24 hours after removal, but none after that; in another camp there were six cases during the first 24 hours and 29 in the second, but none afterwards; in the third there were no fresh cases, although there had been 57 cases in this party before their removal.

17. *Native Army. General Sanitary History in* 1890.—In speaking of the influenza epidemic and of some other diseases among European soldiers, we have already made reference to the experience of the Native army in respect of these diseases. As a whole, the sanitary history of the Native troops during 1890 was not favourable. The results among different bodies are thus compared by the Sanitary Commissioner:—

	Total Deaths per 1,000, including Absentees.	Average Strength present with Regiments.	Ratio per 1,000.			
			Admissions into Hospital.	Constantly sick.	Deaths from Cholera.	Present Deaths from all Causes.
Bengal Native Army	21·82	64,080	1,306	42	3·28	19·16
Madras „ „	20·64	26,032	924	·41	·54	15·63
Bombay „ „	12·92	24,032	1,139	35	·12	10·99
Central India and Rajputana Regiments	9·96	5,118	702	21	·78	9·96
Hyderabad Contingent	6·71	7,071	553	17	—	4·81
Native Army as a whole	18·64	127,746	1,137	39	1·83	15·91

It will be observed that under every head the ratios vary greatly. Taken as a whole, both sickness and mortality were greater than they had been since the year 1881. In Table XXII. the details are given for 17 groups of stations, and there the constrasts are very remarkable. The ratios for admissions into hospital vary from 674 among the Madras soldiers in Northern Madras, to 2,487 among Bengal troops in Burma. We omit in this comparison the statistics of Madras troops in Upper Burmah, as they are not fairly comparable with those of regiments spread over Burmah generally. The Bengal troops in Burma also yield the highest sick-rate, 112 per 1,000, the lowest being 26, among Bombay troops in the Konkan. Among Bengal troops in Burma also the death-rate was highest, 78·68, whereas in the Nagpore group it was only 6·85. If we take the history of individual stations we find that in many of them the sickness was very great and the mortality heavy. In a few these were connected with field service or outpost duty. Among Bengal troops on the Chin-Lushai expedition the admissions into hospital equalled 3,415, the constant sick 72, and the deaths 36 per 1,000. Among 14 other bodies of men the admission rate exceeded 2,000. In many places the death-rates were very high. The maximum 179·59 was attained among a small body of men marching in Burma, but of this 175·51 was due to cholera. The next highest death-rate, 93·84, was also in a great measure due to the same cause. It is recorded at Dharmsala.

18. *Sanitary Defects.*—The extent of the sickness and mortality in each station is clearly shown in the summary of the sanitary sheets for Native troops in the three Presidencies, where the local conditions are also described. Among these conditions we observe that, more or less, overcrowding was a very common defect. At Fort William this evil was very grave, for at times 868 men were placed in quarters where there was proper accommodation for only 392. It is explained that the overcrowding was occasional, but even when only temporary such a serious diminution of air and space per head must be attended with great danger. The sickness here equalled 27·97 admissions per 1,000 and the deaths 32·21. Although this is an extreme case, overcrowding is a defect which is very frequently mentioned in these sanitary sheets, and it is one which ought to be remedied. Another serious defect which is not uncommon is the want of proper drainage. At Alipore, for example, it is noted "surroundings low lying and badly drained, and swamps are formed during the rains"; at Barrackpore the drainage is reported to be "very bad." Here the mortality was only 8·21, but sickness was prevalent to the extent of 1,700 admissions per 1,000. At Benares, drainage is said to be "defective during floods." At Sialkot, "drainage defective." At Meanmeer, "lines under water during heavy rains." At Jacobadad, "drainage bad in wet weather." In many places complaint is made of the water-supply; in others the conservancy is at fault; in others again the men are believed to underfeed themselves. Some further information on this most important subject of local defects, is to be found in the summary of the Annual Sanitary Reports on the cantonments, but these include Bengal only. In connexion with the outbreak of cholera which occurred at certain places during the year, attention is specially drawn to defects in the water-supply, to which these outbreaks are attributed. At Chaubuttia the water-supply is described as "doubtful and subject to accidental contamination," at Naini Tal to be "not above suspicion," at Debra to be "open to contamination," and the same is said of the supply at Dharmsala. It is hardly necessary to point out that all these are evils which ought to be dealt with.

19. *Military Sanitary Works.*—In addition to summarizing the Bengal Cantonment Reports, Section VIII. gives an account of the military works completed or in progress during the year 1889–90, which could not be furnished in the Report for 1889. No great works are mentioned. The money was chiefly expended on barracks, officers' quarters, and hospitals. It is mentioned that at Rawulpindi the sudder and cantonment water-supply was in progress, and that the preliminary survey of the water-supply project for Muree was finished. During 1890–91 the expenditure on military works designed for the health and comfort of troops in India amounted to Rs. 91,02,988,

but detailed information regarding them was not available. It would be interesting to know how far the troops in the neighbouring cantonments have participated in the benefits of the new water-works which have been inaugurated of late years in certain towns, especially in the North-Western Provinces.

20. *The Jails of India.*—In the separate memoranda on the Provincial Sanitary Reports, we have already commented on the vital statistics of the general population, on the history of the chief diseases among them, on vaccination, and on civil sanitary works, each of which forms the subject of a distinct section in the Report of the Sanitary Commissioner with the Government of India, and in regard to them we have no further remarks to offer. It only remains to consider the health of the jails of India during 1890. This important matter is dealt with by the Sanitary Commissioner with the Government of India in the fourth section of this Report. The statistics of the year are fully discussed, not only as a whole but also in provinces, in different geographical groups, and in individual jails. As a whole the results show an improvement on those of former years. In consequence of the epidemic of influenza both admission and constant sick-rates were high, but the death-rate (31·49) was lower than it had been in any of the individual years, or than the average in any of the five-year periods with which it is compared. The reduction of the death-rate in respect of both cholera and bowel complaints is a marked feature in this comparison. The general facts for 1890 in the three Presidencies are shown in the following statement:—

Presidency.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
Bengal - - -	57,500	1,236	39	1·67	9·36	32·37
Madras - - -	7,702	810	28	2·60	7·54	25·32
Bombay - - -	7,284	861	29	·55	7·96	32·81

In all the provinces of Bengal, except the North-West and the Punjab, the mortality in 1890 was less than it had been in 1889. In the North-West it rose from 28·37 to 33·82, and in the Punjab from 29·19 to 31·29. In the others there was a decided diminution, especially in Burma, Assam, and the Central Provinces. The same remark holds good also for the Presidency of Madras. In the Bombay Presidency, on the other hand, the statistics are less favourable than in 1889. All these facts, and many other details, are clearly tabulated in the Sanitary Commissioner's Report, and we need not repeat them here. He has, moreover, singled out the jails in each province where the mortality was high, and to some of these we would draw attention, coupling the fact of more or less excessive mortality with the information given regarding their sanitary condition as shown in the the abstract of the sanitary sheets. Beginning with Lower Bengal, we have the jail at *Arrah*, with 2,286 admissions and 132 deaths per 1,000. The strength was small, only 143 prisoners on an average, and of the total death-rate of 132 118 was caused by cholera. The following defects are noted: "Excessive ventilation in winter, water liable to contamination, site very objectionable, and drainage "defective." *Rungpore*, also a small jail, 1,154 admissions and 83 deaths per 1,000. No cholera. All that is said is that "ventilation is defective in the female and lower storeyed barracks, and that the "drainage project for the town completed during the year benefits the jail." Or, to take a larger jail, *Midnapore*, with an average of 830 prisoners and no cholera, returns 801 admissions and 45 deaths per 1,000. It is said: "Water-supply defective and insufficient, personal cleanliness consequently defective, and "bowel complaints prevalent." In the North-Western Provinces we take the following:—*Gorakhpur*, strength 445, admissions 1,271, and deaths 98 per 1,000. No cholera. "Drainage on the "west and south of the jail defective during the rains. Water in the jail well exceedingly bad, but water "is now procured from a well in the city. Surroundings very objectionable, the ground being low and "liable to floods." *Muttra*, strength 246, admissions 1,422, and deaths 69. No cholera. "Con-"siderable overcrowding existed in the 'under trial' ward and in Barrack No. 10 during the last "three months of the year." In the Punjab there are several instances of excessive mortality. In the small jail of *Dharmsala* the prisoners suffered from cholera as well as the troops in the neighbouring cantonment. The sanitary sheets records: "Lateral ventilation insufficient. Personal cleanliness "neglected, there being no convenience for washing in the winter and in bad weather. Clothing very "defective. Surroundings unclean and objectionable." Another Punjab jail, *Delhi*, with an average of 564 prisoners, returns 2,588 admissions and 62 deaths per 1,000. No cholera. "Overcrowding "during part of April and from July to November." Many other examples might be cited of excessive sickness and high mortality concurring with manifest and serious sanitary defects. These sanitary sheets are specially valuable, because they set the two sets of facts, the state of health and the local defects, side by side. They deserve special attention, because they are the first step towards real practical sanitary work, which consists in the removal, as far as possible of every local condition which is prejudicial to health. From this point of view we regard these sheets, not only in the case of jails but also of cantonments, and of towns and villages where the needful data can be obtained, as the most important part of the whole Sanitary Report, and would urge that the greatest care should be taken in their preparation.

21. *General Conclusions on all the Indian Sanitary Reports.*—As this is the last of the Indian Sanitary Reports for 1890 to be noted upon, we shall take the opportunity of recapitulating very shortly some of the more important suggestions and recommendations we have made in our separate memoranda on these reports, both as regards the preparation of such reports in future, and also, which is of much more practical moment, as regards the general principles which ought to govern the management and conduct of sanitary work in India.

1. The experience of another year has strengthened our conviction in regard to the points noted at the close of our memorandum on the Sanitary Reports for 1889 concerning—

(*a*) Registration of births and deaths.
(*b*) The necessity of recognising in all sanitary reports the powerful influence which atmospheric phenonema and the food supply must exercise on the health of the year.
(*c*) A uniform system of mapping out the history of cholera in each province during the year.
(*d*) The great value of the new Provincial Sanitary Boards as an agency for inaugurating and carrying out real sanitary work.

To these we would now add the following recommendations:—

1. That advantage should be taken of the Census of 1891 as compared with that of 1881 to check the registration of births and deaths during the intermediate years, and ascertain not only by provinces, but also by districts and large towns, how far this registration is corroborated by the Census figures.

2. That in recording the history of cholera year by year, attention should be given to the collection of facts regarding the area over which it was distributed, the localities within that area which were affected by it, and the sanitary condition of those places which suffered most severely from it, rather than to supposed histories of importation and other matters which, even if they could be established as facts, can form no basis for efficient preventive measures.

3. That in recording the history of all diseases the same practical object should be kept in view, and that, in order to aid its attainment, a standard form of statement should be adopted in all sanitary reports which might take the place of the various ones now in use, and none of which furnish all the data desired. This statement should show in consecutive columns—

The district.
Town or rural area.
Total population.
Male population.
Female population.
Number of births during year.
Birth-rate per 1,000 of population.
Number of deaths during year.
Deaths from cholera per 1,000 of population.
Deaths from small-pox per 1,000 of population.
Deaths from fevers per 1,000 of population.
Deaths from dysentery and diarrhœa per 1,000 of population.
Deaths from injuries per 1,000 of population.
Deaths from all other causes per 1,000 of population.
Deaths from all causes per 1,000 of population.
Sanitary defects.
Measures taken for improvement.

4. That the influence of vaccination in checking small-pox should be shown by recording side by side, during a series of years for each district, the annual successful vaccinations and the annual ratio of deaths from small-pox per 1,000 population.

5. That whenever any unusual prevalence of disease threatens, such as the influenza epidemic of 1890, early steps should be taken by the Sanitary Commissioner to collect, as far as possible, full particulars regarding the time and place and extent of its distribution, and that these should be recorded in the annual Sanitary Reports.

6. That the Report of the Sanitary Commissioner with the Government of India should give some account of the working of the Voluntary Venereal Hospitals in the different provinces and their effect, if any, on the extent of venereal diseases among European soldiers.

7. That, having regard to the interesting researches already made concerning the *Bacillus Typhosus*, careful investigations should be carried out to ascertain how far it is present in cases of fever which are not decidedly of an enteric type.

22nd August 1892.

No. 2.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner for Bengal for 1890.

Registration of Births.—In this Report the first point that calls for notice is the continued imperfection of the vital statistics. The registration of births was confined, as before, to municipal towns, which embrace a very small part of the population of the province, but though the work was so restricted the result was most disappointing, and this, notwithstanding the endeavours of the Sanitary Department to obtain more accurate data. In Bengal there are altogether 145 municipal towns, but in three of them, which had been but recently constituted, registration had not been commenced. The figures thus relate to only 142 municipal towns, many of them small places with a few thousand inhabitants in each. In only nine of them did the population exceed 50,000. The whole taken together return a birth-rate of 21·54 per 1,000 for the year as compared with 22·76 in 1889. There can be no question that in both years the ratio is much below the truth. The discrepancies in details fully bear out this statement, for on examination of the birth table appended to the Report it will be seen that the rate varies from 1·57 at Jangipore to 53·89 at Madhubani, and between these extremes there is every variety of gradation. As a whole, the male birth-rate stands at 11·38 and the female birth-rate at 10·16, but here again these averages are made up of most discordant elements. At Sewan the number of male births recorded to every 100 female births was only 77, at Sudharam it was 366. If we take the actuals the extraordinary discrepancies become, if possible, more marked. As an illustration we may take the two municipalities Buxar and Dumraon, which stand side by side on the list, each with much the same population of about 17,500 inhabitants. In the one the number of births registered was 203, and in the other 563. Many other examples of a like kind might be cited from this statement. It is very remarkable that in this matter of birth registration Bengal should be so far behind the other provinces, and that, too, in spite of the fact that in the hope of securing greater accuracy it is alone in restricting this registration to the municipalities. The authorities are well aware that the registration is most incorrect, and several of the illustrations showing its manifest imperfections, which we have cited, have been already brought forward and commented on both by the Sanitary Commissioner and by the Government of Bengal in their orders on this Report. When we remember that the birth-rates are all calculated on the Census figures of 1881 instead of on the larger population of 1891, the inaccuracy of the results becomes even more marked. The more recent figures were not available when the Sanitary Commissioner prepared his Report, but now that they are available we would suggest that he should take the records as entered in his Annual Reports since 1881, adding all the births for each municipality and deducting all the deaths, and then show how the results so obtained compare with the Census figures of 1891. A clear statement of these results might serve as the basis of an earnest endeavour on the part of each municipality, whose records are manifestly imperfect, to attain greater accuracy in the future.

2. *Deaths.*—The registration of deaths is not like the births, confined to municipalities, but extends over the whole province. According to the Census of 1881, which still formed the basis of calculation in this Report, the mortality so registered equalled 24·48 per 1,000. If taken on the increased population of the 1891 Census, it would have amounted to only 22·96, or about this ratio, as the preliminary figures of the recent census alone were available when the Sanitary Commissioner's Report was prepared, and these did not include the people moving by roads, railways, or boats, and so far fall short of the correct total. When these come to be included the death-rate would be even less than 22·96. There can be no doubt that the actual death-rate among the people in Bengal is much higher than this. The Sanitary Commissioner and the Government of Bengal are both of opinion that it cannot be less than 34 per 1,000, and if this estimate be assumed to be within the mark, then nearly 800,000 deaths must have been omitted from the registration during 1890. In both districts and towns the variations in the mortality recorded are very marked. In the former they range between a mimimum of 14 and a maximum of 40 per 1,000, while in the latter the extremes are 6 and 82. Even after making ample allowance for the great fluctuations which are to be met with in the vital statistics of Indian towns in different years, these figures are sufficient evidence of the inaccuracy of the registration. According to sex the registered deaths equalled 26 among males, and only 22 among females. It is worthy of notice that in every district, with the single exception of Khalna, the mortality among males exceeded that among females. In Sarun this excess amounted to 7 per 1,000. In Khalna the excess among females was 1 per 1,000. Where the registration is so generally imperfect, it is not surprising that the information regarding the mortality at different ages should be manifestly inaccurate. The ratio for children under one year is given as 186 for males and 152 for females. Between one and five years of age the rates are 28 for boys and 25 for girls. In Calcutta, where registration is more accurate, the death-rates at these periods are about double the figures above quoted, and these higher ratios are much more in accord with the experience of the other provinces in which registration has been more successfully carried out than in Bengal, as may be seen from the following statement:—

Provinces, &c.	Death-rate per 1,000 of Population.			
	Under 1 Year.		1 Year and under 5.	
	Male.	Female.	Male.	Female.
Bengal	186	152	28	25
North-West Provinces	348	316	72	68
Punjab	318	305	115	113
Central Provinces	336	287	39	33
Hyderabad	308	256	91	79
Calcutta	313		52	

In the Calcutta ratios, which are taken from the Report of the Sanitary Commissioner for Bengal, and which are for the year 1889, the sexes are not distinguished. The figures for the other provinces are by no means cited as accurate. They also bear evidence of much imperfection as regards the probable death-rate among male and female children, but as regards the total death-rate among children they are evidently much nearer the truth than those for Bengal.

3. *Measures for Improving the Registration.*—We have entered at some length on the manifest imperfections of the registration of both births and deaths in the province of Bengal, because it is of the highest importance, from a practical point of view, that decided progress should be made in this most important basis of sanitary work. So far very little has been done, and after many years the results are not much better than they were when the system was first introduced. Speaking of the births registered during 1890, the Sanitary Commissioner says:—"The birth-rate returned for 1890 is "even worse than that of the previous year, a result which is most discouraging to the Sanitary Depart- "ment, as it has taken such pains to impress on municipal commissioners, by the issue of numerous "circulars, and also by personal exhortation, the importance of the subject, and the benefits which "follow correct and systematic registration, but nothing seems to awaken interest in the subject, "and the result is that Bengal has made no advancement, but rather a retrogression during the "last 10 years." His Honour the Lieutenant-Governor, in his orders on the Report, observes, in reference to the admitted defects in the registration, that "the Sanitary Commissioner should now "take steps through the district authorities to bring home to the commissioners of the municipalities "mentioned above the necessity of paying more attention to this branch of their duties, and should "utilise every opportunity that may offer on his tours of inspection of testing the registration in "municipalities where the death-rate is unreasonably low, and of ascertaining whether proper "arrangements are made for reporting deaths and maintaining the prescribed registers." The municipalities specially referred to are 22, in which the recorded death-rate was under 15 per 1,000. It is further observed that the Sanitary Commissioner's suggestions for improving the registration which were made in his inspection report of the Dinajpur municipality seem well adapted for the purpose, and that if made to all municipalities in Bengal they would doubtless be largely adopted. On turning to this inspection report, which is printed with others in the Appendix, we find that these suggestions were as follows:—

(1.) Municipal overseers, &c., and peons should be instructed to make inquiries regarding births and deaths while on their rounds, and to report the result to the registrar of the circle in question;
(2.) The registrar should also, when his other duties permit of his doing so, himself make such inquiries in the town;
(3.) The sircar of each ward in the town should be required to submit a daily report of any births or deaths which may have occurred in his ward;
(4.) Midwives should receive fees for registering births; and
(5.) The Compulsory Registration Act should be actively worked against defaulters; that is to say, defaulters should be prosecuted in every case.

It will be of interest to see what results follow these measures, and how far they become general in the municipalities. We shall only add that, as we remarked in reviewing the Indian Sanitary Reports of 1889, more use might be made of the vaccination staff in this important matter. Both the Deputy Sanitary Commissioners, and at least the higher native subordinates in their tours might do much to check the registers and bring omissions and evident errors to notice. The registers of vaccinations may, in fact, be compared with those of births and deaths, and greater accuracy thereby gained in both records. Children will no doubt be discovered who ought to have been vaccinated but have not yet been operated on, and, on the other hand, children may be on the vaccination records whose births have never been registered.

4. *History of the Chief Diseases.*—The causes to which the deaths were ascribed, and the proportion of the mortality due to each are shown in the following statement, to which has been added the mean ratios of the previous five years, so far as they can be ascertained. It will be seen that this mean for the province as a whole equalled 23·02 per 1,000; in 1889 the rate was 24·25, and in 1890, as already mentioned, it stands at 24·48. In the opinion of the majority of the district medical officers, the year 1890 was more unhealthy than its immediate predecessor, the mortality from *small-pox* and *fevers* was greater, and although *cholera* was less prevalent the province was affected, it is said for the first time, by a serious epidemic of influenza. The price of food was somewhat higher than usual.

CAUSES of DEATHS in BENGAL during 1890 registered among a population of 65,859,534 according to the Census of 1881.

Cause of Death registered.	Number of Deaths registered.	Ratio per 1,000 of Population.	
		In 1890.	Mean of previous Five Years.
Cholera	145,885	2·21	2·24
Small-pox	12,619	·19	·09
Fevers	1,155,569	17·54	16·29
Bowel complaints	43,451	·65	·83
Injuries, suicide	2,861	—	—
„ wounds or accidents	15,115	—	—
„ snake bite, or killed by wild animals	11,502	—	—
Total injuries	29,478	·44	—
All other causes	225,477	3·42	—
Total from all causes	1,612,479	24·48	23·02

5. *Cholera.*—The history of cholera in Bengal during 1890 is illustrated by several maps showing its prevalence in different parts of the province, and by diagrams which indicate the extent of the mortality it has caused month by month over a series of years. The marked fluctuations in the death-rate from cholera during these years is worthy of notice, especially when taken in connexion with the fact that though the extent of the disease varied much, it preserves in a remarkable degree its seasonable character, rising and falling year after year at or about the very same time. In the general history of cholera in Bengal during 1890, there is nothing which calls for special comment. It was less prevalent than it had been in the year previous, but it was present more or less in every district of the province, and in most of them it was present in almost every month of the year. The four districts which suffered most were Faridpore and Dacca in the south-east, and Bhagulpore and Chumparun in the north-west, and between these lies a large area which suffered little. In none of the districts did the cholera death-rate in 1890 approach the high ratios recorded in Poori and Balasore during 1889 (21 and 13 per 1,000). The highest cholera death-rate in a district during 1890 was 8 in Faridpore. The Report throws no new light on the cause of cholera. It emphasises what has long been known that the extent of the disease varies enormously in different years, that whatever this extent may be its rise and fall are largely dependent on season, and that its incidence is governed in a great degree by local conditions. From a practical sanitary point of view, this last is the most important field for inquiry, and we shall therefore draw special attention to a few of the descriptions given by medical officers of the local conditions under which the people live in some of the towns and districts. The Civil Surgeon of Poori writes: "The decrease in the number of "cholera cases in 1890 cannot, I am afraid, be ascribed to any better sanitation; in spite of my "earnest endeavours to put a stop to the use of the water of the Sita Ganga tank, it is still used "by pilgrims. The tank is a disgrace to civilisation; to walk round it makes one turn sick from "the stench. The magistrate also has tried to effect some improvement in this tank, but without "result." At Bhagulpore the history of the year is interesting. The Civil Surgeon says: "The "fact that in Bhagalpore town there was again a reduction in the number of deaths from cholera "should be noticed, and this notwithstanding the very large increase of deaths in the district, "including places near the town, such as Colgong, 20 miles distant, Bihipore, which is on the "opposite side of the river, and Bhagalpore and Amanpore rural circles, which are continuous with "the town. The improvement is owing to the supply of filtered water, and to the extensive use of "it by persons at a distance from the hydrants, many of whom fetch the water from long distances." The Civil Medical Officer of Noakhali attributes the cholera to "the badness of the water which is "used for drinking. Most of the tanks so used become scummy and perceptibly stinking during "the dry weather." The Civil Surgeon of Tipperah writes that "the slushy sides of the tanks, pits, "and creeks, are open latrines, and their water is indiscriminately bathed in, and used for drinking "and cooking purposes. Where private latrines exist they are generally found situated conveniently "near one of these common sources of water-supply." Other illustrations might be cited, but these will suffice. As usual in some places the disease is attributed to importation. But whatever may be the truth on this point it is quite clear, especially in a country like Bengal, that no measures directed against this supposed cause of disease can be taken, and that the only safeguard consists in removing as far as possible all local insanitary conditions such as are described in the above extracts.

6. *Small-pox.*—The statistics of small-pox agree with those of cholera on two very important points, first, that the mortality caused by the disease varies enormously from year to year; and secondly, that its rise and fall are very much governed by season. In illustration of the first point, it is sufficient to refer to the table given by the Sanitary Commissioner in paragraph 31, in which the deaths are given for each of the last 11 years, and from which it will be seen that whereas the small-pox deaths in Bengal during 1887 numbered only 3,846, in 1881 they numbered 24,371. The year 1890 in this respect holds a middle place, with a death-roll of 12,619. The monthly incidence is shown in the statement which is given in paragraph 32, where the general experience of former years is repeated for 1890—a maximum of deaths in March and April, amounting in this year to 2,202 and 2,410, and a minimum of 278 in October. Statement No. VIII. in the Appendix is

devoted to show as far as possible the distribution of small-pox during the year. From this may be seen how far it added to the death-rate in each district, how it affected males and females, and also the number of young persons who died from it. This last information is of special importance in its bearing on the work of vaccination, which is part of the duties of the Sanitary Department in all the provinces of India. The record is by no means satisfactory, for it shows that of the total of 12,619 deaths registered as due to small-pox, 2,380 were of infants under one year, and 5,735 of children between one year and 12 years of age, so that the total deaths among children amounted to 8,115, or two-thirds of the total at all ages. The Sanitary Commissioner observes that in certain circles where the vaccination staff have been more energetic, the protection afforded seems to have been more efficient. It is only by taking the records of small-pox mortality in each district over a series of years, and comparing this with the protection afforded to the people in that district over the same period, that any sound conclusion can be drawn as to the amount of good that has really been done by vaccination. A comparison of this kind is attempted in the orders of the Government of Bengal on the Vaccination Report for 1890–91, but the mortality from small-pox only for the one year, 1890–91, is compared with the proportion of population protected by vaccination during the seven years 1884 to 1891. Having in consideration the great fluctuations in the deaths from small-pox in different years, it would lead to more correct conclusions if the small-pox deaths were taken over the same years as the vaccinations. Even then the difficulties which beset any comparison of this kind are very great, for not only are the statistics of deaths most imperfect, but the returns of the vaccinators are also little to be depended on. But making allowance for both sources of error, the Government of Bengal has arrived at the conclusion that "some real progress is being made, and "that vaccination in Bengal, in spite of bad lymph and careless operators, does afford substantial "protection from small-pox." The mention of "bad lymph" has reference to the fact that the arrangements for the supply of lymph during the year had proved unsatisfactory. The prejudices of the people against vaccination, especially in certain parts, continue to be very great, and add materially to the difficulties of dealing satisfactorily with this most important matter. Measures were being taken to ensure the supply of better lymph in future, and otherwise to render the Department more efficient and acceptable to the people.

7. *Fevers.*—The deaths from fevers as usual supply a very large proportion of the total mortality of the year, and in 1890 they appear to have been more fatal than in any previous year since registration was introduced. In the diagram furnished at page 24 the annual fever mortality is shown for each year from 1874 to 1890. In the first three of these it varied from 5 to 9 per 1,000, in the next three from 10 to 12. Between 1880 and 1885 it varied from 11 to 15, from 1886 to 1889 it remained pretty steadily at about 16, and in 1890 it attained a maximum of 17 per 1,000. The high ratio of 1890 the Sanitary Commissioner ascribes to the heavy rainfall, excessive floods, and the inclusion under this head of the deaths due to the epidemic of influenza, which he believes to have been imported from Europe and to be "rapidly infectious." It is not explained on what grounds these beliefs are based, and it is very desirable in regard to this disease, and indeed in regard to all diseases, that the evidence of well ascertained facts should be placed on record. Although it would have been difficult and indeed impossible to have obtained a full history of the epidemic among the people, much valuable information might have been collected from civil surgeons regarding the time at which the disease first presented itself to their notice, the circumstances which attended these cases, the period during which influenza was prevalent, and many other interesting data which might have thrown some light on the many complicated questions connected with it, and which it is most desirable should be placed on record. The marked increase in the fever mortality recorded during late years as compared with that of the earlier years may in part be due to better registration, but the Sanitary Commissioner is of opinion that the increase is to a large extent real, and that it is due to greater saturation of the soil caused by defects in drainage. To these he believes that the development of roads and railways, the construction of bunds and fishing weirs on rivers have all contributed, as they all tend to obstruct the natural drainage of the country. There can be little doubt that in Bengal good drainage is one of the most important sanitary improvements which could be effected, but it is unfortunately also most difficult of accomplishment. It is one of the points to which the attention of the newly constituted provincial Sanitary Board is being directed. We are referring now to the general drainage of the country, the drainage of individual municipalities is dealt with separately. As was to be anticipated, the fever death-rate presents great variations in different districts, from 31 per 1,000 in Julpaiguri, to 9 in Sarun, and only 5 in Poori. In many of them the high mortality is found concurrent with manifest defects in drainage and a water-logged condition of the soil. We shall be much interested to learn what measures the Sanitary Board can suggest for removing or diminishing these great evils.

8. *Sanitary Defects.*—The other great causes to which the deaths of the year were assigned have been tabulated in paragraph 4 of this memorandum, and call for no special remark. The remaining two sections of the Report, *Sanitary Works* and *Personal Proceedings*, are most important, because the really practical work of the Department is included in them. This work consists of two distinct parts, *first*, the bringing of sanitary defects to notice, and, *secondly*, the measures taken to remedy these defects. On the first of these heads some details are given in the statement contained in paragraph 64 of the Report, but they refer only to municipalities and are limited to a description of their drainage and water-supply. In many of them there is no proper drainage, in others, although the natural drainage is good, the levels of the drains are defective. At Cossipore-Chitpore it is noted that drainage is obstructed by the railway line, a similar remark is made regarding Kustea At Patna it is said that "a proper scheme of drainage is the crying want of the town." The drainage at Poori is described as "very defective, the whole place daily soaking in an enormous

" discharge of fluid of the worst kind." Swamps, low-lying ground, pits and other irregular excavations abound in the vicinity of many of these towns and receive much of the drainage of the town, in which there is a considerable amount of sewage. In the same way the tanks, which are often the chief source of drinking water, become polluted. With few exceptions it may be said that the water-supply is exposed to great dangers. Many of the defects both in drainage and water-supply are extremely difficult to deal with, owing to the nature of the country and the expense of any proper scheme of improvement; but it is of importance all the same that the defects should never be lost sight of as evils which demand removal in the interests of the public health. As will be seen presently, some of them have already been taken in hand.

9. *Personal Proceedings.*—Much inspection work was done by the Sanitary Commissioner and his subordinates. By the latter many hundred villages and towns were visited during the year, but more information is desirable as to the system under which these inspections are conducted, the condition in which places are found, and the steps suggested for their improvement. The state of birth and death registration and of vaccination as elicited by inquiry on the spot are special subjects for report, as well as the local conditions in respect of drainage, water-supply, and other sanitary matters. The Sanitary Commissioner's own reports of inspections are of much interest, and contain many excellent practical suggestions. He very rightly insists on the necessity for cultivating the land which has been used for trench latrines, and it is satisfactory to find that certain places which have followed this advice have found the system not only efficient but profitable, as the land so treated has yielded a large return. We may remark that such trenches often err in being too deep—one foot is sufficient, the lower half being filled with night-soil and the upper half with earth. Failure has often ensued because this very simple procedure has not been adopted.

10. *Amount spent by Municipalities on Sanitary Works.*—The various headings under which money was expended for sanitary purposes in municipalities were conservancy, drainage, water-supply, disposal of dead, markets, slaughter-houses, vaccination, and treatment of the sick. The latter is a heavy item and might with advantage be shown apart from the other details. The total expenditure during 1890 under all the heads above given amounted to Rs. 13,41,090, representing some increase over the total of the previous year. Appendix III. shows how the money was spent in each municipality. It went chiefly in keeping up establishments and in minor works, such as the erection of latrines, improvement or extension of surface drains, &c. Among major works, the most important was the construction at Rungpore of a canal for both drainage and water-supply. The bed of the Ghagal which had silted up, thereby rendering the soil water-logged and the place most unhealthy, has been canalised at a cost of Rs. 60,000. At Bhagalpore the water-supply was being extended in pipes over a larger area, at a cost of Rs. 11,000. In this same Appendix details are given of what was being done in rural areas. Rs. 43,762 had been expended by district and local boards during the year in sinking wells, excavating and clearing tanks, and improving drainage channels. At the same time, Rs. 2,65,785 had been laid out by private individuals on the excavation of tanks, the provision of improved water, and similar sanitary improvements. Particulars of these are also included in Appendix III.

11. *The Sanitary Board.*—It only remains to notice the proceedings of the Provincial Sanitary Board. Though constituted in December 1889, it did not come into full working order till August 1890. The Lieutenant Governor thus summarises what has been done:—"The most "important subjects which came under their consideration were the drainage and water-supply "of the town of Howrah, the drainage of the municipalities on the east bank of the Hooghly, and "the drainage of the towns of Serampore and Poori. A complete scheme for the drainage of Poori, "which has long been a source of serious danger to the health of the town, has been sanctioned by "Government since the close of the year. A scheme was also drawn up for Serampore and adopted "by the Municipal Commissioners. Government has sanctioned the loan of Rs. 30,000 required to "carry out the project, and it is understood that work will be commenced as soon as the necessary "land has been acquired and made over. The question of the drainage of Howrah is still under "consideration. Besides these large projects the Board considered and approved during the year "several minor schemes for improving the drainage of North Dum Dum, Maniktola, Cossipore-"Chitpore, Bally, and Utterpara municipalities, but in none of them, except Utterpara, was any "real progress made." It will thus be seen that a good commencement had been made, and, as the influence of the Board is more and more felt, much progress in sanitary work is to be looked for.

12. *Vaccination.*—The progress of vaccination is dealt with in a separate report. This is for the year 1890–91, and is mainly taken up with administrative details which have been already fully reviewed in the orders of the Local Government and of the Government of India. Into these details we need not enter. As we have already remarked in discussing small-pox, the great, and indeed the only real efficient test of the progress which vaccination has made, is its effect over a series of years in diminishing this disease, and we have suggested the kind of evidence which ought to be collected and produced year after year on this important point. The question illustrates forcibly the valuable information which is to be derived from the mortuary registers in relation to practical sanitary work, but to afford such evidence the registration must be at least fairly accurate. Fortunately small-pox is a disease which is generally recognised by the people, and, although errors do arise by confounding measles and other diseases attended by a skin eruption, the registration of deaths under this heading is surrounded by fewer difficulties than those under fevers and some of the other headings in the standard forms. Statistics of vaccination are always more or less subject to suspicion, except in so far as the results have been actually verified by careful inspection, and this suspicion is much

increased when the measure of success claimed seems greater than could be reasonably expected. The figures for Bengal are certainly open to this criticism, for an average success in primary vaccination over the whole province of 99·45 per cent. seems hardly credible. The figure for re-vaccination, 39·49 successful cases per 100, has more appearance of truth, but this general average for the province is made up of local results varying between 28 and 100 per cent. We observe that the Sanitary Commissioner employs the terms "re-vaccination" and "secondary vaccination" to mean the same thing, but the intention was, we understand, when the vaccination statements were devised, that the term "secondary" should apply to further attempts to obtain a successful operation, especially in the case of children when, as so often happens from want of care on the part of the mothers and other causes, the first attempt has failed, whereas the term "re-vaccination" was to include cases where the persons concerned appeared to have been protected from small-pox by successful vaccination over a series of years, but the time had come when it seemed advisable to renew this protection. We observe further that, in the statements appended to this Report, certain additions and other alterations have apparently been made in the standard forms prescribed by the Government of India, which greatly complicate statistics, owing to the necessities of the case, very complicated already, and which moreover render comparison between the figures of the different provinces much more difficult, if not impossible. The object of having a standard was to ensure that all the vaccination reports should use the same language, and present the facts on the same basis of arrangement, but, unless the standard is rigidly adhered to, this object is entirely defeated. There is only one other point suggested by this Vaccination Report, and it is one which concerns not only Bengal but all the provinces, and that is whether the large native vaccination staff, especially in its higher grades, might not also be usefully employed in other sanitary work. We have already suggested their being used to check the current registers of births in connexion with their own more immediate work. The registers of deaths might also engage their attention, and they might also do much towards educating the people to see the sanitary defects, of which there is generally abundant evidence before their eyes, and to take an interest in measures for their removal.

23rd April 1892.

No. 3.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Punjab for 1890.

1. *General Characteristics of the Year.*—The sanitary history of the Punjab in 1890 deserves special consideration, because it was the most unhealthy year which the province has known since the registration of deaths was first introduced in 1868. It would have been interesting to have had a comparative statement to exhibit the annual mortality in each of these 23 years, and it is time that in all the provinces simple tables were prepared to which easy reference could be made for information, not only as to the total death-rate of each year, but also as to the main causes to which the deaths were ascribed. Similar statements showing the annual births, and a further series to summarise the records of both births and deaths over a series of years in every district and in the larger municipalities, would make the annual Sanitary Reports all the more valuable as a record of the current history of the public health as compared with the experience of the past. Not only were the deaths during 1890 extremely numerous, there was also a considerable diminution of the births, and the total result was that, taking the province as a whole, the death-rate exceeded the birth-rate by the large proportion of 7·79 per 1,000. This lamentable result was in the main due to the great prevalence of "fevers" in certain districts, to which reference will be made more fully in a subsequent paragraph. Of the general causes which produced the great sickness and mortality, the most important would seem to have been the excessive rainfall. On this point the chief information is contained in Chart D at the end of the Report, in which the fever mortality in each quarter is compared with the rainfall during the same period. From this it appears that the fever mortality in the fourth quarter of 1890 was higher than it had ever been before, and the rainfall in the three previous months was excessive. A similar conjunction is shown in one or two other years, but it is by no means constant. In 1875, for example, excessive rainfall in the third quarter was not followed by unusual prevalence of fever in the fourth. In 1879, again, the rainfall in the third quarter was less than in the same period of 1881, but the fever mortality in the last quarter of 1879 was much greater than it was in the last quarter of 1881. The data, however, are imperfect, because, both as regards fever and rainfall, they embrace the whole province, and therefore merely represent the averages over a large area, the parts of which were very differently affected as regards both the extent of fever and the amount of rainfall. More exact comparison might be made if districts were taken separately. A few of those most subject to fever, taken individually and month by month over a series of years, would afford much more exact, and therefore more valuable, evidence as to the connexion between rainfall and fevers. According to Chart E, the price of food was higher than usual.

2. *Births.*—The birth-rate for the province (39) is composed, as usual, of very varying district ratios. Omitting the frontier, where registration is still confessedly imperfect, and Simla, which is peculiarly circumstanced, these range between 50 in Sialkot to 30 in Umballa. In every district the excess of male over female births is marked. For the province the average is 114 to 100, but this average is largely affected by the high proportion of male births in the frontier districts, where

the imperfection of the registration is evidenced by such proportions as 133, and even 166, male to every 100 female births. The diminution in the number of births registered during 1890 is attributed to the great sickness in certain districts, in which abortion was common. Of this total diminution in the whole province, about one half is accounted for by the smaller number of births registered in the five districts of Sialkot, Gujranwalla, Gurdaspur, and Amritsar, where the sickness was most severe. It is worthy of notice, however, that in all of these districts the birth-rate was high even for India. That for Gujrat, which is the lowest of the five, is 38 per 1,000; in all of the five the birth-rate was above that of some of the districts in which there was no excessive sickness. But what is most remarkable of all is that Sialkot, which suffered most, and where the enormous mortality of 102 per 1,000 is recorded, stands at the head of all the districts, with a birth-rate of 50 per 1,000. We observe from Appendix D. that in the town of Sialkot the ratio was 43, but of the rural areas no particulars are given. This is one of those cases in which a comparison of the items which make up the district average might be made with advantage. We draw attention to these points, not with the object of questioning the fact of the fewer births consequent on the frequency of abortion due to the great sickness. Such explanation seems very natural, but it still remains to inquire whether there are any circumstsnces to explain the high birth-rate in particular districts.

3. *Deaths.*—During the year no less than 883,149 deaths were registered, representing a death-rate of 46·87 per 1,000, by far the highest ratio that had ever been recorded in the Punjab. The nearest approach to it was 38 in 1879. As shown in our memorandum on the Sanitary Report for 1889, the Punjab differs from other parts of India in this respect, that the mortality registered among females exceeds that among males. In 1890 this excess amounted to 2·79 per 1,000. It was very general throughout the province. There would appear to have been only seven districts out of the total of 31 in which the female did not exceed the male mortality. In the age table (No. IV.) the infant mortality is shown to be greater among males than among females. These are the results if taken on the population of 1881, as all the tables are, but if the infant deaths are calculated on the number of births during the year, the death-rate among males is 261 compared with 274 among females, and this seems the more accurate method of computation. The deaths among both infants and children between one year and five in the fever districts was lamentable. It was reported that in 59 villages of the Sialkot district every child born during the year died. In two villages of the Gujrat district, each containing 300 families, which the Civil Surgeon visited at the close of the epidemic, he found neither infant nor child alive. The excessive mortality among the people was widely distributed. In 15 out of the 24 districts in which the registration is more to be depended on, the rates exceeded 40 per 1,000; in five of these it exceeded 50 per 1,000, and Sialkot it reached the enormous maximum of 102. In the municipal towns a similar story is told—a high death-rate very common, and an excessive death-rate in many of them, the maximum being reached in Gujrat, where it amounted to 129 per 1,000. As regards the distribution by months, the Sanitary Commissioner observes that the deaths in March and April were more than ordinarily numerous, and this he ascribes to the "widespread epidemic of influenza which occurred during these months and the month of May. "This disease seems to have made its appearance in the Punjab in the month of March, and that it "spread over the greater portion of the province is proved by the fact that cases were reported in "16 jails, including Rohtak and Delhi, in the south-east, and Hazara Dera Ismail Khan, and Dera "Ghazi Khan in the north-west." As we have remarked in noting the want of information regarding influenza in other reports for 1890, it is much to be regretted that steps were not taken at the time to collect all the data that could be procured regarding this epidemic, as the facts drawn from so large an area would have been specially valuable.

4. *Mortality in relation to the Census.*—The ratios of both births and deaths throughout are based on the Census of 1881, and as no allowance is made for any increase of population during the nine years which had elapsed since the Census was taken, both sets of ratios are no doubt exaggerated. It is hardly possible to correct this source of error year by year. The materials for such a correction do not exist, and even if they did it is not desirable in the present state of the registration in the Punjab to attempt any such refinements in calculations. The object should rather be to improve the recording of both births and deaths, and make it more accurate. To accomplish this end we believe, as we have frequently urged, that the most likely means lies in the constant inspection of the registration, and the testing of the entries by comparing them with the vaccination returns, and with the *vivâ voce* evidence which can be procured on the spot. It does not appear how far anything of this kind is attempted in the Punjab. Particulars of the inspections of towns and villages which were made by the Sanitary Commissioner and his deputy are not given, and valuable information concerning them might be included in future Annual Reports. Although the Census figures for 1891 are not of much importance as a ground work for amending the birth and death-rates of preceding years, they may, as we have already remarked in dealing with other reports, be made most useful for testing the results of registration during the previous 10 years. If the actual number of births registered during these years be added to the population enumerated in 1881, and the number of deaths registered during these same years deducted, then the product should agree, at least in the main, with the population as shown by the Census of 1891. This test has, in all probability, already suggested itself to the Sanitary Commissioner; but if it has not been employed, we would suggest that it should be applied, not only to the Punjab as a whole, but also to each district taken separately, and to at least some of the more important municipalities.

5. *Cholera.*—Chart A., which forms one of the Appendices of this Report, is a very interesting and graphic diagram of the monthly rise and fall of cholera in the Punjab during each of the 24 years from 1867 to 1890. It does not appear how the figures for 1867 were supplied, as the

registration system did not come into force in the province till the year following, and we observe that the other charts which supply similar information regarding small-pox and fevers commence with 1868. We cannot discuss many of the striking facts which this cholera diagram illustrates, but we would draw attention to the very marked differences in the annual mortality. In 1886 only 12 deaths from the disease were registered throughout the whole province. In 1867 the number was 43,146. No figures could well enforce more clearly the contrast between a year when cholera was practically almost absent and a year when it was epidemic. Similar, though not such marked contrasts may be observed between other years. In 1890 cholera may be said to have held a medium place. It was widely spread, in some parts it was severe, but the total deaths amounted only to 3,401. This epidemic, although it was but trifling in comparison with the experience of many other years, presents many points of interest, and is well worth attentive study. As usual, it was most severe in the months of July, August, and September; but, as so often happens, its prevalence in these later months of the year, was heralded by isolated attacks much earlier. In April there were seven deaths, one of them occurring as far north as Jhelum; and this, it is to be carefully noted, was the first death reported during the year throughout the entire province. In May there was one still further north, at Rawul Pindi. It may be that some of the persons whose deaths are so recorded were travellers; but such an explanation is by no means necessary, as isolated cases of cholera have frequently been reported in the early months of the year among both troops and prisoners resident in distant and far-separated places. The epidemic was most severe in three districts of the Delhi division, Delhi, Gurgaon, and Umballa, in the Kangra district, and in the Lahore, Amritsar, and Gurdaspur districts of the Lahore division; but in only two even of these did the mortality it occasioned amount to 1 per 1,000. None of the large cities suffered severely, but in some of the minor municipalities the cholera death-rate was high; as, for example, 6·95 in Shahabad, and 8·34 in Sadhaura, both in the Umballa district. The maximum of 15·29 was reached at Sonepat in the Delhi district. Turning to Appendix A., in order to obtain information as respects the local condition of this place, we find that there was "continuous flooding of considerable area during rainy season." The same remark is applied to three other *thanas* which stand beside it on the list; and in regard to the whole of the *thanas* in this Delhi district, it is said, "There is no attempt to drain the "site areas of villages. Refuse is generally placed quite close to habitations. General sanitary "conditions unsatisfactory." Villages affected suffered much more severely than towns affected, the proportion being 7 to 1; and this result the Sanitary Commissioner thinks is to be accounted for by the fact that the drinking water in villages is much more subject to pollution than in towns. It is always dangerous to draw conclusions, especially in regard to cholera, from the facts of any single year taken by themselves. There have not been wanting instances in which large towns in the Punjab have suffered with great severity.

6. *Relation of Cholera to Railways.*—There is another statement made by the Commissioner, in which we cannot help thinking he has been too hasty. He says: "Many railways have now been "opened in the province, affording rapid means of communication between distant places, and the "disease is doubtless rapidly distributed by that means." In this he is merely repeating what he said in other words in his report for 1889. In our remarks on that report, which formed part of our general memorandum on all the Indian Sanitary Reports for that year, we drew attention to this subject, partly because it is one of great practical importance, and partly because it afforded an illustration of a not unfrequent defect in sanitary reports, that opinions are expressed without any evidence being adduced in support of them. We have examined this report in order, if possible, to find any facts tending to show that the epidemic of 1890 in the Punjab was affected by the railways, but we can discover no facts of this kind. On the contrary, the whole history of the epidemic would seem to prove that the railways had no influence whatever in this respect. In order to see this clearly, it is only necessary to look at the cholera map. Beginning with the south-east, we have cholera beginning in the Delhi district on 25th April. The next important place on the line going north-west is Umballa, and here it did not appear till the 2nd June. Next Ludhiana, 21st June, or south to Goorgaon on 12th May. All these places are within not many hours' distance by rail from one another. Many other examples might be cited; but we need only add, generally, that there is no instance of rapid spread such as requires the introduction of the railways to explain. In connexion with the railways, indeed, the most remarkable fact is the exemption of large areas through which trains from affected districts were daily coming. This is to be seen in the large tracts traversed by the line from Lahore to Peshawar in the north-west, and from Lahore to Mooltan in the south-west. Both these tracts of country suffer very slightly; in many of the districts comprised in them there was no cholera at all. On the other hand, districts removed from railways suffered to a considerable extent. If it could be shown that the railways are the great disseminators of disease, they would certainly be far from an unmixed blessing to the people; but there is no evidence of the kind. The problem to be solved is whether the improved means of communication have rendered epidemics of cholera in India more rapid and widespread than they used to be, and the facts, so far as we are acquainted with them, entirely negative any such supposition. If the matter were merely of theoretical interest, we need not have said so much about it; but theoretical statements of this kind are apt to lead, and have led, to attempts at measures of prevention which have produced no good, but rather evil, results, and have diverted attention from the really important practical work of sanitation.

7. *Small-pox.*—The history of small-pox in the Punjab during the last 23 years, as illustrated in Chart B., gives ground for believing that vaccination is exercising considerable protective influence. The differences in the number of deaths between one year and another continued very marked; but during the last 11 years there has been nothing like the mortality of 49,489 persons from this disease

in 1879, and the still higher figure of 53,195 in 1869. In 1890 the total under this head was 8,922. It was chiefly in the lower parts of the province that these deaths occurred. In four districts of the Delhi division the small-pox deaths exceeded 1 per 1,000. In Kurnal the maximum of 1·99 was attained, and this occurred in connexion with manifest defects in the Vaccination Department, which have since been remedied. In only one of the more northern districts did the deaths exceed 1 per 1,000, and this was in Sialkot. A reference to Table VI. shows that the highest death-rate from this cause in any of the towns there given was 5·19 in the town of Shahabad, in the Umballa district; but the list appears to be incomplete, for in Appendix A. much higher ratios are tabulated, as for example, 7·86 at Gurdaspur, and 8·05 at Puthankot in the same district. The relative prevalence of small-pox is the best test of the efficiency of the Vaccination Department, and it is therefore important that every Annual Sanitary Report should show clearly for each district the small-pox mortality during each of a series of years, and the number of persons successfully vaccinated during these same years per 1,000 of population.

8. *Fevers.*—The great event in the sanitary history of the year was the remarkable epidemic of fever. There had been nothing like it in previous experience. The greatest number of deaths ever registered before under this head was 472,939 in 1879; in 1890 the number amounted to no less than 692,511. The main facts are that fevers were more than ordinarily prevalent over the whole province, but that the violence of the epidemic fell chiefly on four districts, which lie in a group side by side, and in which the registered mortality from "fevers" and "from all causes" during the year stood at the following enormous ratios per 1,000 of population:—

Sialkot	from fevers 83,	from all causes 102.		
Gujranwalla	„ 76	„	85.	
Gujrat	„ 69	„	79.	
Gurdaspur	„ 50	„	65.	

These are for the district as a whole. In individual towns and "thanas" much higher ratios are to be found even than these. In the Sialkot district the thana of Satrah recorded 153 deaths per 1,000 from fever alone; in Gujranwalla, Wuzirabad thana recorded 105 under the same head, and the town of Gujrat 115. It was in the months of September, October, and November that the mortality was at its height, and the coloured map which the Sanitary Commissioner has appended to his report portrays very graphically the results in those months as indicated by the relative number of deaths. In three of the districts, Sialkot, Gujranwalla, and Gujrat, the mortality from all causes, of which fevers were by far the greatest, was at the rate of 200 per 1,000 per annum. This bare statement is in itself sufficient, without further description, to show how widespread and fatal was the sickness, and how great must have been the sufferings of the people. Among children the fever was specially fatal, and, as we have already said, when speaking of the relation of mortality to age, in some villages the children were entirely swept away. These lamentable results are attributed by the Sanitary Commissioner to "water-logging of the soil produced by excessive rainfall, and the flooding "of large tracts of country by overflow from rivers, streams, and canals." As is remarked in the orders of the Local Government, this is a matter which will require the careful attention of the Sanitary Board. In the summary of the Board's proceedings, which is given at the end of the volume, we observe that the great sickness in the districts of Sialkot and Gujrat had been brought to their notice by the Sanitary Commissioner, and that "the Board resolved to ask the Local Govern- "ment whether any steps had been taken to obviate, in future, excessive flooding in the neighbourhood "of Gujrat." It is further stated that means have been taken to secure this important end, but no particulars are entered into as to what these means were.

9. *Deaths from other and "all Causes."*—As regards the deaths registered under "dysentery and diarrhœa," "injuries" and "all other causes," we have no special remarks to offer, and shall summarize," in tabular form, the mortality under these and all the other headings for the year 1890.

Population according to Census of 1881 - - 18,842,264.
Births registered - - - - - - - = 39·08 per 1,000.

Causes of Death.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	3,401	0·18
Small-pox	8,922	0·47
Fevers	692,511	36·75
Dysentery and diarrhœa	17,163	0·91
Injuries—Suicide	370	—
„ wounds and accidents	4,280	—
„ snake bite, or killed by wild animals	1,039	—
Total injuries	5,689	0·30
All other causes	155,463	8·25
Total from all causes	883,149	46·87

10. *Sanitary Defects.*—In narrating the history of the chief diseases during the year, incidental reference has been made to certain grave sanitary defects connected with these diseases, more especially to the want of proper drainage in connexion with the great fever epidemic, and to the pollution of the water-supply in connexion with cholera. In the tabular statement marked

Appendix A., the Sanitary Commissioner briefly describes the condition of the drainage, the water-supply, and the domestic cleansing and conservancy in each of the municipalities and thanas of the Punjab. Columns are added to show the population, the death-rate from small-pox, fevers, dysentery, and diarrhœa, as well as the receipts and expenditure of each municipality on account of conservancy. This is a very valuable statement, because it localises diseases side by side with disease causes, and therefore furnishes the best possible groundwork for searching out all such causes and removing them as far as possible. But the statement would be still more valuable if it included the birth-rates, the deaths from cholera, and the total mortality from all causes. This information is all the more necessary, because cholera is generally recognised by the people themselves, and all the data which can be obtained regarding it ought to be placed on record; and, further, although there may be, and certainly will be, under existing circumstances, great errors as to the causes of death, every death ought to be registered with accuracy. The total mortality from all causes is thus the great fact to be ascertained and considered side by side with the local conditions. If we take the head of Drainage, we find that in many districts, as was to be expected, there is much that needs doing. It is frequently noted that the drainage is defective or bad, that there is a liability to floods and soakage of the soil. The ground is often low-lying, and the natural obstacles to be overcome great. In some few instances the evil is attributed to a canal or railway embankment. The question is a very large one, and is beset with difficulties, but there is no more important matter that can engage the attention of the Sanitary Board. The great remedy for malarial fever, from which the Punjab suffers so heavily, is drainage and cultivation. The water is in most places reported to be of good quality, but whether taken from tanks, as it is in some parts, or from wells, it is liable to pollution. In some it is brackish, and in a few the supply is deficient. The condition of the conservancy varies greatly, sometimes "satisfactory," at others "defective," or there is "no conservancy system at all." In some districts the villages are described as "extremely filthy," and among the rural population generally, conservancy is little known.

11. *Sanitary Works.*—It is gratifying to note that in many districts some work of real sanitary improvement was being carried out. In the Delhi district, for example, the waterworks for the town of Delhi itself were well advanced, and a scheme for draining certain water-logged tracts by the Western Jumna Canal was in progress. In the Kurnal district drainage projects for two different places were in hand. At Simla the drainage was materially improved, and a water-supply for Kalka completed. The extra-mural drainage of the city of Jullundur was approaching completion, and the drainage of the town of Ludhiana was in progress. At Amritsar the city ditch, which had been a receptacle for all manner of filth, was filled up. Some advance was made in the extra-mural drainage of Gujranwalla. At Peshawur the city water-supply was in progress. In addition, a number of minor improvements were carried out both by the local authorities and by private individuals; of these a long list is given, consisting chiefly of new wells. Moreover, many important schemes of drainage and water-supply were in contemplation, and for some of them the projects had been already prepared, and only awaited the orders of the Government. The record altogether manifests a very hopeful activity in sanitary matters. It is worth noting that in the Punjab the disposal of sewage and town sweepings as manure has been carried out to a considerable extent. In 1890, Rs. 1,20,790 were realised from this source, and although there is still in many places a prejudice against using sewage as manure, the sales show a steady annual increase. Several towns derived a considerable income from the sale of sewage and sweepings. Some interesting details on this subject are given by the Sanitary Commissioner, which might be found useful in other parts of India.

12. *The Sanitary Board.*—The Provincial Sanitary Board was not constituted till August 1890, but it at once entered on its duties, and took steps to obtain information as to the wants of the province. Regular returns are submitted to it every quarter by deputy commissioners, showing in each of the municipalities of their respective districts what measures of improvement are proposed or are being taken, and, if actually in hand, what progress has been made with them. Schemes for improving municipalities, or for draining water-logged tracts or other objects, are submitted for opinion and advice. The Board thus exercises a general control over the sanitary improvement of the province, and as the more important officers of the Government are all members of it, the influence exerted cannot fail to give a decided impetus to progress in the right direction. Among other important matters which have engaged their attention, we observe that they were preparing a Village Sanitation Act. By its constitution, the Board is a consultative body, but the Lieutenant-Governor is "prepared to delegate to it from time to time powers in respect of any particular project "or work, or in regard to any special inquiries which might seem necessary." The addition of a special sanitary engineer to the Board, we venture to think, would be a very valuable assistance. The members of the present Board have all their own very onerous duties to perform, with which their time must be fully occupied. A separate engineer, especially if one could be secured who had devoted special attention to sanitary matters, could do a great deal that does not seem under the existing system to be provided for. He could aid the Sanitary Commissioner very materially in searching for the causes of any prevailing sickness, or of the persistent unhealthiness of particular places, and he could, on the other hand, also aid the municipalities and other local bodies by devising schemes of improvement, by making preliminary surveys and estimates, and so giving them at least a rough idea of the cost of what was proposed.

13. *Vaccination.*—The separate report for the year 1890–91 shows that the work of vaccination was actively and successfully carried on during the year. It is not necessary to recapitulate the details, which are fully set forth in the Report itself, and which have been examined already in the orders both of the Local Government and of the Government of India. It is sufficient to note that while, owing to special causes affecting the Kangra district, the number of persons vaccinated was

not so large as in the year previous, it amounted to 850,142; of these 595,134 were cases of primary vaccination, 565,094, or 94·95 per cent., being successful. The average number of vaccinations performed by each vaccinator, 2,850, was high compared with that attained in other provinces, and the same remark applies to the proportion of persons successfully vaccinated per 1,000 of the population, which equalled 37·15. The number of children under one year of age successfully vaccinated during 1890–91 was 429,637, while the births registered during 1890 amounted to 736,406. These figures do not include the Native States, in many of which it is gratifying to learn that nearly 100,000 operations were performed, with a large percentage of success.

23rd April 1892.

No. 4.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the North-Western Provinces and Oudh for 1890.

1. *General History of the Year.*—In the North-Western Provinces and Oudh the year 1890 was generally unhealthy. There was a marked prevalence of fever; the people suffered also both from cholera and small-pox in a more than ordinary degree. The result was that the registered deaths equalled 37·27 per 1,000, or an excess of 6·16 over the ratio for 1889. The death-rate for 1890 was indeed higher than it had been since 1879, when it attained the very high rate of 44·81. During the intervening 10 years it fluctuated between a minimum of 27·57 in 1883 and a maximum of 35·86 in 1887. The birth-rate was above the average of previous years, amounted to 39·70 per 1,000; but owing to the great mortality the deaths in many districts exceeded the births, and the total excess of births over deaths throughout the whole province was only 2·43 per 1,000, or less than half that recorded in 1889. The general results, as regards both births and deaths, and the causes to which the deaths were ascribed are shown in the following table:—

1890.

Population according to Census of 1881, 44,107,869.
Births registered, 1,751,168 = 39·70 per 1,000.

Causes of Deaths.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	80,295	1·82
Small-pox	55,394	1·26
Fevers	1,244,326	28·21
Dysentery and diarrhœa	53,604	1·22
Injuries—suicide	2,873	—
„ wounds and accidents	17,089	—
„ snake bite or killed by wild animals	6,582	—
Total injuries	26,544	·60
All other causes	183,864	4·17
Total from all causes	1,644,027	37·27

Of the general factors at work during the year with which these results may be connected, the two most important are the meteorological conditions and the price of food. As regards meteorology, the only information given is as to the rainfall, and here the facts are very strikingly exhibited in a table, which contains for each division of the province the average monthly fall over a series of years, the fall for each month in 1890, and the extent to which this last varied from the average. In all of the 11 divisions of the province the rainfall of 1890 was in excess of the average, and in some of them the excess was great. In both the Fyzabad and Benares Divisions it was over 15 inches. Taking the prices of June and December for the previous 20 years as the standard, the grains which mainly compose the food of the people were certainly dearer than usual, a result which does not appear to have been due to any defect in the harvest, but to have been caused by the large export of wheat to Europe.

2. *Births.*—As has been already mentioned, the comparatively slight excess of births over deaths during 1890 was due not to any diminution in the number of births, but to a very marked increase in the number of deaths. The birth-rate for the year was, indeed, higher than in any of the preceding four years, and amounted to 39·70 per 1,000, or an increase of 3·23 on the ratio of 1889. The Sanitary Commissioner is of opinion that birth registration in the province is approximately accurate, but the details for different districts manifest great extremes, from 24·46 in Dehra Dun to 51·43 in Hardoi. The high proportion of male to female births, 110 per cent., is also suspicious, especially as this proportion for the province as a whole is made up of such contrasting district elements as are to be found in Form I. at the end of the Report. In Garhwal the proportion of the sexes was almost exactly equal, in Dehra Dun the male births registered were 133 to every 100 females, and between these extremes there are many intervening gradations. It is worthy of notice that the abnormally high proportion of male births at Dehra Dun is coincident with the very low birth-rate of 24·46 in this district, and both results point to serious defects in registration. Similar

illustrations might be cited from the records of the municipalities. The reports of the Deputy Sanitary Commissioners, which form Appendices B, C, D, deal more or less fully, among other matters, with the registration of vital statistics, but the experience of these officers and the opinions expressed by them differ materially. The Deputy Sanitary Commissioner of the first circle found no evidences of inaccuracy. The Deputy Sanitary Commissioner of the second circle thinks that the deaths are more fully and faithfully recorded than the births, but that registration, as a rule, is making progress. The opinion of the Deputy Commissioner of the third circle, on the other hand, is unfavourable, and he believes that the registration is still very inaccutate. The differences in the views of these officers on the subject may in part be due to the fact that in some parts of the province the system has made greater progress than in others. Constant inspection of the registers and a comparison of the entries with the facts which may be elicited on the spot, and with the vaccination returns are among the best means of obtaining more perfect results.

3. *Deaths.*—A statement of the results recorded during the last 13 years shows, as already mentioned, that the mortality of 1890 (37·27) was greater than it had been for 10 years. In addition to ordinary causes, the rains were excessive; there were unusual floods, and in the early months of the year an epidemic of influenza added considerably to the death-rate. Some account of this epidemic would have been of much interest, and a valuable addition to the history of a disease which had been so widely spread over the world during recent years. The data collected would necessarily have been imperfect, but the more important facts might have been ascertained by the aid of civil surgeons and of the district officers and their subordinates, such as the date when the disease appeared, the time during which it was prevalent, and the parts which suffered most. A great epidemic like this deserved more than a merely passing mention in the sanitary history of the year. The district ratios from all causes range between a minimum of 24·81 in Ghazipur and a maximum of 54·97 in the Tarai, but most of the districts suffered in an unusual degree. In 20 out of the 49 the mortality exceeded 40 per 1,000, and in three of these it exceeded 50. Among males it equalled 38, and among females 36 over the province generally. Among infants under one year the mortality was very heavy, but among them the ratio for boys was 348, while that for girls was 316. As a whole, the deaths in towns equalled 41·12, and in the rural areas 36·99, but the town ratios exhibit very remarkable differences, some of which can only be accounted for by errors of registration.

4. *Census of* 1891 *and improvement of Registration.*—Both births and deaths have been calculated on the Census of 1881. The results of the Census of 1891 were not fully known, and, even if they had, they would not be applicable to the Report of 1890. Although the changes which take place in the population during 10 years must be considerable, and prove a disturbing element in estimating both birth and death rates, it seems better to accept this source of error than to attempt to fix a more correct figure year by year in accordance with a supposed idea of what the proper population really is. In India no data yet exist for such annual estimates, and even in Europe such estimates have not always been found to agree with the facts as afterwards elicited by the census. In the orders of the Local Government on this Report advantage has been taken of the Census of 1891 to test the registration during the previous 10 years. All the recorded births have been added to the population as given in the Census of 1881, and all the deaths have been deducted. According to these calculations the population in 1891 should have been 47,068,587, whereas in the census returns it came out as 46,931,002. As the Lieutenant Governor remarks, this close correspondence affords a valuable confirmation of the general accuracy of registration throughout the province, but it is very desirable that in his next report this test should be applied by the Sanitary Commissioner more closely, and that he should show what are the results of this method of calculation when carried out in each district, and also in some of the municipalities. Exact accuracy cannot of course be expected in any of them, as births and deaths frequently occur among people who are not residents, but the data would be valuable for comparison, and might be usefully employed as illustrating, among other advantages, the information to be obtained by correct returns. The question of improving the vital and mortuary statistics had been considered by the Sanitary Board, and recommendations which they made had been accepted by the Government. It does not appear, however, what these recommendations were. The Sanitary Commissioner mentions that a commencement had been made to differentiate, as far as practical, the chief causes of mortality among the general population, and that classified lists were being submitted with a view to the systematic differentiation of the causes of death. Without further particulars, it is not possible to form an opinion on the change which was being attempted, but, in the absence of medical men or others capable of any nice distinction between one disease and another, it seems hardly possible to expect a more exact classification of the causes of death than is provided for in the statistical forms. Considering the machinery available, the registration in the North-Western Provinces and Oudh has made very creditable progress, and further improvement is to be looked for rather, as already said, by careful and constant checking of the registers than by introducing refinements as to the diseases to which the deaths were attributed.

5. *Cholera.*—During 1890 the province suffered severely from cholera. Under this head 80,295 deaths were registered, or a ratio of 1·82 per 1,000, nearly double what it was in the previous year (1·0), but falling far short of what it had been in some previous years, especially 1887, in which it amounted to 4·5. The main facts regarding the epidemic of 1890 are shown in Form No. VII., in which the deaths from cholera each month are recorded by districts; in Form No. VI., in which the mortality in the towns is shown separately, and in the cholera map with its appendices, which contain information regarding the duration of the outbreak in each registration circle. The disease was widely spread, every district suffered with the single exception of Lalitpur. There were two maxima. One was in April, to which the south-eastern portion of the province mainly contributed.

At this time there was a severe outburst in Kheri, and 1,443 deaths from cholera were recorded here in that month. The second, and much larger maximum, occurred in September, when the deaths over the province amounted to 21,913. The disease was then severe over a great part of the country. One of the most noteworthy features in the history of cholera in the North-Western Provinces during 1890 was that the epidemic was severe in the huts, which usually escape, and also in the districts more immediately underlying the hills. The Sanitary Commissioner cites the history of an outbreak in the Bulandshahr district, which he considers instructive as to the manner in which cholera is propagated. The particulars are given at page 19 of his Report. On the 8th September a man died of cholera in the village of Bilaspur, and his brother gave a feast in his memory. The rice for the guests had been put in the room which the deceased had occupied, and was supposed to have become contaminated by the exereta from the sick man. The water for drinking was also supposed to have been contaminated by the scrapings from the mud floor which had been thrown into the yard and found access to the well. It is not possible to determine what was the origin of the outbreak without much more complete and exact evidence than is given, but whatever may have been the cause, it was reported that of 226 persons who were at the feast, 139 were attacked with cholera within a few days, and 59 died. Of these cases all but 25 occurred in villages at a greater or less distance from Bilaspur, and the names of these villages, with the number of the guests who were attacked and died in each, are adduced as proof of the manner in which cholera is spread over the country. It is, however, very clear that the facts, so far as they are recorded, warrant no such conclusion. It is evident that, at the feast, the guests came under some influence or combination of influences, the exact nature of which cannot be predicated with any degree of certainty, and that, after returning to their villages, many of these guests suffered in consequence; but it is nowhere stated, nor is there, so far as the record goes, any suspicion that these cases were, even in appearance, the cause of other attacks in the villages concerned. Before the Bilaspur outbreak took place, cholera was widely distributed over Bulandshahr. We find that by the end of August, or some 10 days before the death of the man who is supposed to have been the cause of the outbreak, 397 deaths from cholera had been registered in this district, so that, on a moderate computation, there must have have been some 800 cases of cholera in the Bulandshahr district before the particular cases referred to occurred. The real practical action to be taken, as the Sanitary Commissioner himself points out, is to remedy the defects in local conditions, especially such as come to notice in connexion with severe outbreaks of cholera, of which the most glaring are often the unprotected state of the water-supply, and its liability to be contaminated by impurities. As the Sanitary Commissioner remarks:—"There is no safety against virulent epidemics where there is an unprotected water-supply."

6. *Small-pox.*—The mortality from small-pox was somewhat higher than it was in 1889, but the records of the last few years seem to the Sanitary Commissioner to indicate that vaccination is exerting a decidedly repressive effect. In this respect the experience of the districts of Kumaun and Garhwal is most satisfactory, and there is indeed no portion of India where the results of vaccination have been more eminently successful. In many of the 21 years of which statistics are given for these districts, the disease contributed nothing to the mortality, and in the others the contribution was very small. The same may also be said of the district of Dehra Dun, but, in respect of most of the provinces, it seems too early yet to conclude that vaccination has been sufficiently general to check epidemic outbursts of the disease. The question of the relation of vaccination to small-pox is one of great importance, and we would suggest that it should be fully discussed in all sanitary reports. In some of the towns during 1890 the mortality from small-pox was high.

7. *Fevers.*—As usual, the mortality recorded under the head of "Fevers" far exceeded that under any other head, and attained the very high ratio of 28·21 per 1,000 for the province. The fever mortality in the North-West Provinces during 1890 was indeed greater than that of any other province during that year, except at the Punjab, where, as we shall see in noting on that report, fevers devastated certain districts with extraordinary virulence, and caused the very high death-rate of 36 per 1,000. In the north-west, during 1890, the district ratios vary from 10·67 in Gorakpur to 47·79 in the Tarai. Many of the other districts also suffered severely. Although the maximum of 142,533 deaths was recorded in the month of October, and 130,384 in September, it is to be noted that the third highest figure, 129,021, was reached in the month of May, when malarious influences are generally at a minimum. There can be no doubt that many deaths not really due to malarious fevers are registered under this head. The Sanitary Commissioner believes that many of those recorded in the earlier half of the year were due to influenza. He is further of opinion that "very "high maxima in the death ratios are in some measure due to epidemic cholera, small-pox, &c., but "chiefly to fevers probably of an infectious nature, superadded in certain seasons to the ordinary "simple continued and malarial fevers. Such fevers are not to be confounded with enteric fever, "which, in all probability, is ordinarily the chief cause of mortality among natives at an early age, "as it is among Europeans in India." No evidence is adduced in support of the proposition that the fevers of India are chiefly of "an infectious nature"; nor does it seem to rest on any ascertained facts. On the contrary, the experience of the numerous medical officers in charge of Native troops and prisoners, where the sick are under thorough observation, is altogether opposed to such an idea. We are well aware that in certain years outbreaks of fever have occurred in some of the jails, especially in Upper India, which were regarded as contagious, and that similar fevers have also been reported in villages of the Northern Punjab, but these were exceptional occurrences, and seem in the jails at least to have been dependent in great measure on dangerous overcrowding. The point to which we wish to draw attention is the Sanitary Commissioner's statement that fevers

of "an infectious nature" are common among the general population of India, because we find no evidence of this in the facts set forth by him. The supposed prevalence of enteric fever among natives of India seems to be equally at variance with experience. The Civil Surgeon of Lucknow is quoted in paragraph 154 as being of opinion that many of the "fever" deaths are "undoubtedly caused by enteric fever," and he supports this opinion by the fact that he has treated many cases of the disease in private practice among the native residents. So far as we can gather, this is the only evidence that enteric fever is a common disease among the natives of India, and it is not in accordance with the experience of other Civil Surgeons throughout India. It is opposed to the experience of medical officers in charge of troops and prisoners, who have excellent means of observation. The Sanitary Commissioner's views seem to be based chiefly on theoretical arguments. "The enteric fever of England and India," he says, "is one and the same disease, and it is not "surprising that this preventable cause of mortality should be so widespread and more fatal usually "than all other diseases under the unsanitary and favouring conditions which exist everywhere in "India." We do not offer any opinion as to whether enteric fever is or is not a frequent disease among the natives of India. It would obviously be very important to establish the point one way or the other upon satisfactory evidence. But, in the meantime, we would point out that sanitary reports should be devoted to the collection of well ascertained facts, and that no opinions should be expressed except such as can be substantiated by the evidence so adduced.

8. *High Death-rates in certain Circles.*—The statement which commences at page 47 shows the death-rates from small-pox, fever, and dysentery and diarrhœa in each circle of registration during 1890. The information it contains would be still more valuable if another column were added to show the total mortality in each of them from *all causes*, because, in the present imperfect state of the registration as to the disease to which the death is ascribed, it is necessary to look at all the figures before drawing any conclusions. Under all the headings given the variations are very marked. In many of the circles, for example, no death was due to small-pox, in several it exceeded 10 per 1,000, and in one it reached 16 per 1,000. This apparently was the maximum. In a very few circles there were no deaths from fevers, in others they were very numerous, amounting in Kotawara, a rural circle of Garhwal, to 148, and in New Jhansie to the incredible ratio of 338 per 1,000. In both of these circles the population was small, but in others, with considerable population, fever death-rates of 50 and 60 per 1,000 were not uncommon. Under "Dysentery and Diarrhœa" there are also marked differences, but nothing to approach the extremes relating to fever. The illustrations have been taken from different districts, but, even within the same district, there are often remarkable variations, and they are to be found under all the three headings. In the Bijnor district, for example, small-pox graduates between entire absence, as a cause of death, in several circles, and a death-rate ascribed to it in each of two circles of 13 per 1,000. In the Cawnpore district the "fever" mortality varies from 10 in one circle to 82 in another. In Hamirpur the deaths from dysentery and diarrhœa, which were a mere fraction in one circle, equalled 12 per 1,000 in two of the others. Such marked differences seem to call for careful local inquiry as to the cause—are they only apparent, due to imperfections in the registration, or, if they are real, what are the local insanitary conditions with which they can be connected?

9. *Sanitary Defects.*—Many places were visited during the year by the Sanitary Commissioner and the three Deputy Sanitary Commissioners, and the results are set forth in Section X. of the Report, which is devoted to the Sanitary Commissioner's own "Personal Proceedings," in the Annual Reports of the Deputy Sanitary Commissioners, which form Appendices B, C, and D, and in the tabular statement which contains an abstract of sanitary reports on towns by all these four officers. As the result of his inspection of 31 towns, each containing more than 5,000 inhabitants, and of 385 villages, the Deputy Sanitary Commissioner of the first circle is of opinion that the chief defects relate to drinking water and conservancy. The wells were generally liable to receive impurities, either because their mouths were nearly on a level with the ground or because there was no platform around them to secure proper drainage. The latrines were often found to be foul, and the night-soil disposed of in an unsatisfactory way. The Deputy Sanitary Commissioner of the second circle inspected 10 municipal towns and more than 200 villages. He believes that the first step to be taken in village sanitation is the care and conservancy of the village well. He bears testimony to the general desire evinced in municipalities for improvement. He urges what has so often been urged before, that in every one of them a well-devised plan of improvement should be thought out and gradually acted on as funds will admit, and this system of operations will no doubt form part of the general measures of reform to be instituted by the Sanitary Board of the province. The Deputy Sanitary Commissioner inspected 15 towns in the third circle and also a number of schools, all of which were specially reported on; but he does not mention how many villages he visited, nor does he bring to notice any special local causes of disease which came under his observation. The "Abstract of Sanitary Reports" refers to 46 towns which were inspected by the Sanitary Commissioner or his deputies during the year. It shows in each the birth and death-rates, the condition of the water-supply, drainage, and conservancy, and adds remarks as to its more urgent sanitary requirements. Although the supply of water in almost every one of them is reported to be sufficient, and in many of them its quality is said to be "fair," its general condition is one more or less liable to contamination by impurities derived either directly or by soakage through the soil. In many places the drainage is said to be very defective, and the conservancy to be in an unsatisfactory state.

10. *Sanitary Works.*—These and other defects have been brought to notice in the inspection reports, and Section IX. of this Annual Report for 1890 shows what has been done to remedy them.

Of major works are the schemes of water-supply for the cities of Agra, Allahabad, and Benares. The Agra waterworks were opened in December. The works at Allahabad were in a forward state by the end of the year, and those at Benares had also made considerable progress. The minor improvements effected at different places are enumerated in detail, and consist of such works as the relaying and other improvement of surface drains, and the construction of wells, markets, latrines, and urinals. From several municipalities there is no information. The history of the year under this important head would be more complete if a general statement were given such as has been furnished in other sanitary reports, including all municipalities, and showing in the case of each what is the total income and what amount of that income has been expended on work connected with the improvement of the public health.

11. *The Sanitary Board.*—The Provincial Sanitary Board had commenced work, and promises to prove of much value. We observe, however, that it is looked upon as a purely consultative body, and that there is no special sanitary engineer attached to it. In Bengal proper the appointment of such an officer is one of the most important elements in the whole scheme. He works in concert with the Sanitary Commissioner, he helps him in devising measures of improvement, and renders valuable aid to municipalities in getting up projects. He is, in fact, as the Bengal Government describes him, "The right-hand man of the Sanitary Commissioner in all matters involving engineering knowledge and experience." The addition of such an officer to the Sanitary Board of the North-Western Provinces would, we believe, be a great gain. Its proceedings, as now constituted, are summarised in a memorandum by the Secretary to the Board, which forms Appendix A. It held frequent meetings during the year. Among other important matters special reports on the sanitary condition of municipalities which it had called for were considered, and the attention of the local authorities was drawn to the defects thus brought to notice. The drainage of specially insalubrious tracts also engaged attention, as well as the improvement of mortuary and vital statistics, the pollution of rivers by town sewage, the preparation of standard plans of latrines, slaughter-houses, and other sanitary appliances, and the fixing of scales of conservancy establishments for municipalities to be applied according to population, and other local requirements. Special measures were recommended for protecting the hill stations of Naini Tal and Mussoorie from cholera, from which both had suffered during the year. The Board also offered advice as to a Village Sanitation Bill. Some particulars regarding this important measure are given in the orders of the Government. "The Bill," it is said, "is permissive in its nature, and will not take effect unless it has been specially extended. It is "intended, in the first place, to secure a better water-supply for villages containing over "2,000 inhabitants, not being municipal towns or towns under Act XX. of 1856, by giving the "magistrate power to call on the proprietors to provide good wells. Secondly, it gives power to the "magistrate of a district to cause improvements to be made to the drainage as well as to the water-"supply of villages situated within the radius of one mile from the municipal limits of the head-"quarters of a district, or from the limits of a cantonment, and to the Local Government to make "rules regulating conservancy, and prohibiting public nuisance in such villages. Thirdly, it enables "the District Magistrate and Sanitary Commissioner or Civil Surgeon to concert measures for "dealing with formidable outbreaks of epidemic in any village or town in which the provisions of "Act XX. of 1856 are in force. Where necessary, the cost of improving the water-supply or the "drainage may be provided by advances of public money." This important Bill has, it appears, been subjected to considerable amendments consequent on the recommendations of the various authorities consulted, and may be amended still further before it passes into an Act. We would venture to observe that the measures contemplated under the third heading as sketched above in the passage quoted from the orders of the Local Government require very serious consideration, and we would suggest that the Act should show very clearly what is permissible and what is not. An Act, it appears, was passed in March 1891, laying down the duties and powers of municipalities in the construction and maintenance of waterworks. We would suggest that in future sanitary reports copies of all such Acts should appear in full as an appendix, so that the record of the year in respect of all steps taken for the improvement of the public health may be as complete as possible. With the same object, further information might also be given regarding all other sanitary action of importance taken during the year; such, for example, as the measures which the Sanitary Board suggested for rendering the registration of births and deaths more accurate, which we have already referred to in paragraph 4 of this memorandum, and which it appears were accepted in the main by the Government; also the special measures recommended for protecting hill stations from cholera and other matters in respect of which it is desirable that full particulars should appear in the Annual Reports.

12. *Vaccination.*—The separate Vaccination Report for 1890-91 has been fully reviewed in the orders both of the Local Government and of the Government of India. The year's operations show a considerable advance both in the number of persons vaccinated and the amount of success attained, and these results are all the more gratifying, because they are not confined to particular districts, but are widely distributed through the province. There was also a considerable increase in the proportion of successful cases among children, which is of great importance, as the mortality from small-pox falls so largely on them. Of the total of 55,394 deaths from small-pox in 1890, 16,084 were infants under one year, and 33,123 of children under 12 years of age. The extent of inspection by Deputy Sanitary Commissioners, by Deputy Superintendents of Vaccination, and Native Superintendents of Vaccination might be increased with advantage. We observe that while the Deputy Sanitary Commissioner of the first circle examined 17,520 cases, the Deputy Sanitary Commissioner of the second circle examined only 6,149, and the Deputy Sanitary Commissioner of the third circle only 4,527. The proportion of persons successfully vaccinated during the year was only 19·48 per 1,000, a small

ratio compared with that attained in some of the other provinces. The number of births registered during the year was 1,751,168, but the number of children under one year who were successfully vaccinated was only 386,293. There is thus a large margin of unprotected persons being added annually to the population. The Sanitary Commissioner furnishes an interesting table as an appendix, showing the annual ratio of deaths from small-pox in the districts and municipalities from 1881 to 1890. If the ratio of successful vaccinations were added under the mortality, the data would be of even greater value, not only as a test of the relation between the two sets of figures, but also as an admirable check on the work of the department. It would then be easy to see where the work had been efficiently performed, and where, on the other hand, more attention was required. The latter columns of No. 1 Vaccination Statement in the Appendix already afford such a means of comparison based on five-year averages; but it is important also to have the figures both as regards vaccination and small-pox mortality for the individual years as well, and the more fully the localities are detailed the more valuable will be the data for practical purposes.

23rd April 1892.

No. 5.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Burma for 1890.

Backward State of Registration.—The registration of births and deaths in Burma makes little progress towards accuracy. It seems to have arrived at a certain point beyond which it makes no advance. If we compare the results of 1890 with those of other provinces, we find that under every heading they point to a very decided deficiency in the record. The birth-rate, for example, 23 per 1,000, is very small. In Madras it was 31; in Bombay and the Central Provinces, 38; in the North-Western Provinces and the Punjab, 39; and in the Hyderabad Assigned Districts, 42. There may be reasons connected with the proportion of the sexes which account for these marked variations, and for the birth-rate in Burma being less than that of any of these provinces, but they are not set forth. Nor would any such reasons explain the even more marked deficiencies which appear in the death-rate. This rate for 1890 is returned as only 17 per 1,000. In the other provinces it ranged between 22 in Madras and 46 in the Punjab. Under all causes of mortality, excepting small-pox, this same place of being at the very bottom, or almost at the very bottom, of the list, is taken by Burma. These are the results calculated on the Census of 1881, but as the population of Burma has increased by nearly 22 per cent. since that census was taken, a much larger increase than in other parts of India, the deficiencies as respects both births and deaths are still greater than these calculations make out.

2. *Births.*—If the birth-rate had been taken on the Census of 1891, instead of being 23 it would have been only about 19. The statistics themselves present internal evidence of inaccuracy. The district ratios, for example, vary from 12 in Toungoo to 36 in Tharawaddy, and if the particulars had been given for towns and rural circles the extremes would probably have been even more striking than this. Then the variations in the percentage of male to female births are indicative of great inaccuracy. The percentage was only 98 in Shwegyin, in Sandoway it was 123. There is, moreover, the direct testimony of district officers to the same effect. The Deputy Commissioner of Bassein records that in two villages he visited only five out of 17 actual births had been entered, and like experiences are reported by others. In the towns the average birth-rate was 20, but this is made up of such extremes as 13 in Rangoon, and 51 in Pegu. The low ratios in Rangoon is accounted for to some extent by the small number of women. On this and other points much light will doubtless be thrown by the recent census. The Sanitary Commissioner mentions that orders have been issued to ensure greater attention being given to the registration, and that test circles have been selected where proper check could be exercised. We doubt much the advantage of having test circles. Local conditions vary so much, and the incidence of disease, and especially of epidemics, is so uncertain that not much practical good is likely to come of them, and there is always the fear of the authorities in each place working up to a preconceived standard of either births or deaths. The object in view can be attained only by constant inspection on the part of all officers on tour, and the gradual education of the people to understand that the accurate record of all such events is most important, as the first step towards discovering the local causes of disease.

3. *Deaths.*—The recorded deaths of the year equalled only 17. If calculated on the increased population they equalled only 12 per 1,000, a rate which must be very much under the truth. In the towns containing over 5,000 inhabitants the rate averaged 29, the minimum being 17 in Tavoy and Mergui, and the maximum 39 in Rangoon. The district ratios vary in an equally remarkable degree, for Amherst returns only 10 and Hanthawaddy 33. As we have suggested in reviewing the Sanitary Reports of 1889, it is very desirable that information should always be given as to the details of the registration circles of which each district average is made up, for it is only by such an examination that the value of the district average can be estimated, and attention at the same time directed to those circles where it is most needed. The male mortality was to the female mortality in the proportion of 131 to 100. This result is no doubt in great measure due to the large number of male immigrants. The only other point that need be commented on as respects the mortality is the mortality among infants and young children, and here again there seems to be

evidence of the defective registration in Burma. Among infants under one year the rates were for males only 142, and for females only 108. In the other provinces the figures are much higher, as may be instanced by the following: Madras, 173 and 147; Central Provinces, 336 and 287; and the North-West Provinces, 348 and 316. Among children between one and five the contrast is just as great, for while Burma returns the mortality at this period as 22 for boys and 19 for girls, in the other provinces the ratios are 27 and 26 for Assam, which gives the next lowest, and 115 and 113 for the Punjab, which gives the highest. Much reliance cannot be placed on the returns of deaths according to age in any one of the provinces, but the general testimony of all of them is against the very low ratios of Burma.

4. *History of the Chief Diseases.*—The experience of the province during 1890 in respect of the chief diseases and other headings under which the deaths were registered is succinctly shown in the following statement. Compared with the year previous the two most notable points of difference are that cholera had largely diminished, and that small-pox had considerably increased. It is to be understood that these and all other statistics refer exclusively to Lower Burma.

1890.

Population according to Census of 1881 - 3,653,629.
Births registered - - - 84,769 = 23·20 per 1,000.

Causes of Deaths.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	1,076	·29
Small-pox	3,693	1·01
Fevers	32,232	8·82
Dysentery and diarrhœa	3,067	·84
Injuries.—Suicide	47	—
„ Wounds and accidents	353	—
„ Snake-bite or killed by wild animals	280	—
„ Total	680	·19
All other causes	22,843	6·25
Total for all causes	63,591	17·40

5. *Cholera.*—The short section devoted to cholera is purely statistical. It does not enter on the history of the disease, nor does it deal with the local conditions of those places which suffered most from it. The main facts recorded are that the province as a whole was singularly free from cholera during 1890—the deaths numbered altogether 1,076. Only twice during the previous 18 years had the number been less than this. In 1888 there is the contrast of a severe epidemic with a mortality of 15,982. In 1890 the disease was, as usual very unequally distributed. In the whole Arakan division, with a population of 562,725, only one death from it was registered. The Pegu and Tenasserim divisions suffered in the same slight proportions, ·19 per 1,000, and the highest in any one district of these divisions was only ·49. In the Irrawaddy division, the loss was somewhat greater, ·61, the most part being contributed by the district of Thongwa, which shows the maximum district mortality of 1·14. In only four of the towns of the province did the cholera deaths equal two per 1,000: two in the Thongwa district, one in the Bassein district, and one in the Henzada district, the maximum (5·67) having been attained at Pantanaw in Thongwa. Such is the information gathered from Statement No. VI., in which the "deaths registered from different causes in the districts and towns of Lower Burma" are recorded, but the table attached to the cholera map makes mention of many towns not to be found in Statement VI., and some of these are towns of considerable size which suffered severely from cholera, such, for example, as the following, taken in the order in which they come:—

Town.	Population.	Cholera Death-rate.
Leingon	5,540	12·64
Okkan	5,951	16·80
Zigon	10,526	18·05
Shwedaung	12,373	14·55
Zayathla	5,913	37·21
Yandoon	12,673	26·03

and others that might be quoted. The only information concerning the sanitary condition of places furnished in the summary, which is given in paragraph 18, and to which reference will be made in connexion with the mortality from other diseases as well as cholera. It may, however, be noted here that some of the towns where cholera prevailed do not appear to find a place in this summary, and from the system adopted of having statements to show the mortality in each town separate from the detailed account of their local condition, it is very difficult to compare these two most important sets of facts, it being borne in mind that this comparison ought to be one of the chief features of every sanitary report.

6. *Small-pox and Vaccination.*—Small-pox caused more deaths in 1890 than it had done for five years. The number was 3,693. In 1884 it was 6,102, the highest recorded during the 19 years from 1872. In 1890 the disease was most severe in the Pegu division; the death-rate in the Prome district of that division having reached the maximum of 4·53. Of the total of 3,693 deaths throughout the province, 2,962 were in children under 12 years of age. The Vaccination Branch of the Sanitary Department was active. As shown in the separate report for 1890–91, the total number of persons vaccinated in Lower Burma rose from 120,552 to 140,321, though it is to be noted at the same time that in some districts there was a decrease instead of an increase. Of the total of 140,321, only 101,252 were primary operations, and of these, again, only 19,289 were successful in infants under one year. Bearing in mind that the recorded births, admittedly much below the truth, amounted to 84,769, it will be seen that much more is needed to protect the current increase to the population. The comparison of the small-pox mortality of 1·01 during 1890 with ·32, the average of the preceding five years and the fact that the small-pox deaths of 1890 were more numerous than in any one of these five years, do not afford very satisfactory evidence of the benefits conferred on the province by vaccination so far; but, as we have more fully explained in dealing with this question in other reports, a more detailed comparison of small-pox and vaccination by districts is essential before any sound conclusions can be formed on the subject. Vaccination was not confined to Lower Burma. In Upper Burma, also, a considerable number of operations were performed, of which 37,047 were primary cases, and of these 30,876 were successful. The Vaccination Act was extended to Upper Burma during the year, and its application to Mandalay and other places was under consideration.

7. *Fevers.*—The deaths ascribed to fevers numbered 32,232, or a ratio of 8·82 per 1,000, a mortality considerably greater than that of the year previous, but less than that of 1888, when the deaths amounted to 36,391. There seems to have been a decided increase in fever deaths of late years, but until the figures of the recent census have been applied to the mortuary statistics it is impossible to say how far this is due to the improved registration and how far to increase of population. The district ratios under the head of fevers vary greatly, from 3·9 in Thongwa to 14·23 in Thayetmyo. No explanation is given of these great divergences. If the ratios for towns be examined, even more striking contrasts are found. As already mentioned, only 20 towns are entered in Statement VI., and among them we have a maximum of 43·12 in Pegu and a minimum of 2·26 in Swedaung. But the statement in paragraph 14 of the Report includes no less than 95 towns, or "townships" as they are called, in every one of which, except five, the population exceeded 10,000. Every town with more than 5,000 inhabitants ought, if possible, to find a place in Statement VI., the only statement which attempts to localise disease more closely than by districts. The 90 towns distinguished in the body of the Report show extremely various results as regards the mortality due to *fevers*, from 1·13 in one place to 29·36 in another. It is very desirable that the causes of such differences should be carefully inquired into. If they arise merely from errors in the registration, then measures should be taken to improve the registration; if, on the other hand, they truly or even approximately represent what occurred, then the differences in local conditions, and more especially the defects in the local conditions of the places which suffered much, deserve special attention, with a view to measures being taken for their removal. The recording of statistics will do little good unless practical action is based on them. The fever death-rate recorded in Burma in 1890, we may observe, is singularly low compared with that in other parts of India, except Madras, where it was only nine. The next lowest is that of Assam (16), but this is double the ratio for Burma.

8. *Dysentery and Diarrhœa.*—Under this head also the mortality recorded in Burma (·8) is much lower than that of other provinces. Bengal alone records a lower rate (·65). In the Punjab it is returned as ·96, and much the same for Madras. In the other provinces it ranges from 1·2 to 5 per 1,000. The deaths in Burma ascribed to dysentery and diarrhœa in 1890 numbered 3,067, or almost the same total as in 1889. In 1888 the total was more than double this number, and amounted to 6,459. The records of different districts and towns display extremes almost as great as have just been instanced in the case of *fevers*, between *nil* in one place and 4·92 in another. The remarks already made under fevers as to the importance of localising accurate records of mortality from different causes, and of considering them in connexion with local disease causes, apply with equal force to dysentery and diarrhœa, and indeed to all diseases.

9. *General Disease Causes.*—Some meteorological tables now appended to the Report, showing at certain observing stations the barometric pressure, the mean temperature, the humidity, and the rainfall during each month, and the averages for the year, but there is no comparison of the results with those of previous years except as to the rainfall, the total of which at each observing station during the year is compared with the average of the previous five years. More exact data are required, dealing not only with individual years, but also with individual months separately. The Sanitary Commissioner remarks that the correspondence between the rainfall and the mortality is usually more observable than it was in 1890, while at the same time it is not to be inferred that "the districts in "which the heaviest rain falls invariably return the highest death-rate, though I believe the relation-"ship would be closer and more obvious with more accurate registration." The only way in which this interesting question can be examined with any completeness is to localise the statistics of mortality and rainfall as far as possible month by month, and thus accumulate data on which sound conclusions may in time be based. Here, as in other reports also, there is a want of information on the prices of food, which have such an important bearing on the health of the people. It is very desirable that this omission should be supplied in all future reports.

10. *Local Disease Causes.*—Information regarding the sanitary condition of individual places is contained in a summary which is given of the reports of the various Health Officers. This, however,

includes only 23 towns and head-quarter stations in Lower Burma. Many towns of considerable size are thus omitted. The summary deals not only with existing defects, but also with any improvements effected during the year. We shall extract a few passages illustrative of the defects. At Akyab "water is obtained from the shallow wells and tanks, both are liable to contamination owing to the "porous nature of the soil. . . . . The Jullia Creek has become an open sewer." At Kyaukpyu "cesspits are in general use." The same is said of Sandoway and other places. At Rangoon "the water contains a large amount of vegetable matter." From the drains "disagreeable "odours are given off . . . . There is a great want of public latrines and urinals all over the "town." At Pegu "wells and tanks are liable to contamination by percolation, and are situated in close proximity to latrines and cesspits." The tenements of the inhabitants other than Europeans, Eurasians, and well-to-do Burmans are "in a very unsanitary condition, cesspits still exist." At Shwedaung the water-supply during the dry season is insufficient. At Pantanaw the water "is not considered good." At Henzada "cesspits exist in most compounds, and are closed only when they become offensive." At Thayetmyo "each house has its own cesspit." At Toungoo "some of the "older wells are in close proximity to sources of contamination, such as privies, &c." A separate summary includes 21 towns of Upper Burma. In this part of the country, also, cesspits seem to be in common use.

11. *Sanitary Works.*—Two statements are given of expenditure on sanitary works, one for Lower and the other for Upper Burma, under the various headings of water-supply, drainage, scavenging, latrines, urinals, markets, burial grounds, and hospitals. Although both markets and hospitals are very desirable, they hardly come within sanitary improvements, hospitals in particular, which form a large item in both statements, being for the cure and not for the prevention of disease. In Lower Burma, out of a total of Rs. 85,231, hospitals cost Rs. 15,246. In Upper Burma they cost Rs. 1,09,633 out of a total of Rs. 2,14,862. It would appear, however, that these figures apply only to expenditure by the Public Works Department in its various divisions. Individual places are not shown separately. The statement would be of much greater practical value if it dealt with each town individually, and showed how much had been expended, not only by the Public Works Department, but also by the local authorities on the construction of new works and the maintenance of conservancy and other establishments. No large sanitary works were begun during 1890, but the summary shows that many minor improvements of a useful character were executed. Among these we note extension of drains at Akyab, erection of public latrines, and repairs to wells. At Rangoon trial filter beds were being prepared, the conservancy of the suburbs was receiving increased attention, and considerable sums had been expended on latrines and urinals on reclamation of low lying ground, and on the extension of the sewerage system. We regret to observe from the remarks of the Chief Commissioner that the Shone and Ault drainage system in Rangoon has proved costly, and has been attended with unforeseen legal difficulties. At Prome the new waterworks acted well, and 60 new hydrants have been put up in private premises. At Paungde old wells had been dismantled and deepened, with satisfactory results, and four new ones sunk. At Bassein all latrines within 60 feet of public wells were closed, and protection afforded from other contaminating sources. Great improvements have been made in the drainage, and the number of cesspits was being steadily reduced. A conservancy tramway has also been constructed, at a cost of Rs. 18,851. In the towns of Upper Burma to which the summary refers, the water-supply, drainage, and conservancy are receiving attention.

12. *Sanitary Board.*—The resolution creating the Sanitary Board is referred to in an Appendix to the Sanitary Report, but it has not been printed, and it is not very clear how the Board is constituted. It would appear that it is composed of the Financial Commissioner, the Under Secretary to the Local Government in the Public Works Department, the Health Officer of the town of Rangoon, and the Sanitary Commissioner; its functions are to advise the Government on sanitary reforms in urban and rural areas, but as municipal towns had already received considerable attention in this matter, the sanitation of rural towns was to be the first object. Rural Sanitary Boards, which had been formed in 1884, but had done nothing, have been revived, and it is believed that they will now become useful executive agencies. The Central Board has held seven meetings since it was first appointed in November 1888, and have discussed many matters connected with the sanitary improvement of the province, and have, among other things, framed a set of simple rules for village sanitation, but practical work was delayed until a sanitary engineer could be procured, and the services of such an officer had not been obtained when the year closed.

10th June 1892.

No. 6.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Central Provinces for 1890.

General Results.—This Report is in the main statistical, and there are many other important matters in regard to which we should have liked to have had much more full information. To these we shall refer hereafter in treating of the various sections to which they properly belong. In the meantime we shall glance at the general results of the year as indicated by the registration of births and deaths. The births show a ratio of 38·41 per 1,000, a high ratio, but somewhat less than it was in 1889, and considerably less than the ratio recorded in some other years, in one of which (1885) it

exceeded 45. The year was generally healthy, especially as compared with 1889. There was a marked decrease in the mortality from cholera, and the same remark applies, though in a minor degree, to small-pox, fevers, and every other head under which deaths are registered. The general result is that, whereas in 1889 the death-rate of the province amounted to 43·79, in 1890 it amounted to only 32·52. No exact information is given as to the price of food, an item which is so largely concerned in the health of the people. Every sanitary report ought to contain accurate data on this subject, not for the province as a whole, because averages of this kind are very apt to prove misleading, but for each district taken separately. These district prices should be carefully considered in their bearing on the figures of registration as respects both births and deaths, not only year by year, but over a series of years. For this purpose it is indispensable that they should be permanently recorded in the Annual Sanitary Reports. The condition of things in respect of food was certainly much better than it had been in 1889. The Chief Commissioner remarks that "There was no real "scarcity in any part of the province, and, except in some of the northern districts, the crops were "better and the conditions of life easier than in the previous year." This remark is fully borne out by the district reports, which are generally favourable, except those from Saugor, Damoh, and Jubbulpore, in all of which the poor suffered more or less from the effect of high prices. The rainfall for the province is described as having been a fraction above the mean of the previous 24 years, but the small value of this calculation is well illustrated by the further remark that "The total rainfall of the year, compared with the mean total of the last 24 years, was greater in "11 districts and below the mean in others." Nothing could show more clearly how little practical information is to be had from averages. What we want to know is the actual monthly fall in each year, and this could easily be shown in a series of district charts, which would not only afford valuable facts in the sanitary history of the year under report, but would also gradually build up important evidence as to the connection to be established between the amount and distribution of the rainfall and the amount and distribution of disease. It is not stated on what data the "mean temperature" and "mean humidity" charts were prepared, but as they are for the province as a whole we fear they are open to the same objection as the mean rainfall.

2. *Births.*—The births registered during the year, as we have already said, equalled 38·41 per 1,000. They numbered 338,644. The differences in different districts, and the marked variations n the proportion of male and female births, lead to the conclusion that though registration in the Central Provinces is fairly accurate, especially considering the great difficulties with which it is beset, still much remains to be done for its improvement. The rate ranges between 49 in Nimar and only 31 in Damoh, a difference of 18 per 1,000. Again, the number of boys born to every 100 girls fluctuates between 101 in Nimar and 112 in Damoh. It is worthy of notice that the birth-rate of towns is 5·78 lower than that of the province, which, in the absence of any explanation, seems to point to imperfect registration, and this conclusion is borne out by the long list of fines awarded in municipalities for neglect of registration both of births and deaths. In considering the probable accuracy or defect of birth registration regard should be had to any disproportion of the sexes in particular places. The recent census will supply valuable material for such an investigation. The birth-rates are given for districts only. These rates are in fact the district means, a very convenient and indeed essential standard for comparison, but some details as to the extremes which are returned by different towns and rural circles in each district, and which go to form the district mean, would not only be interesting but would also form a valuable means of judging of the progress of registration in its several units. It is not desirable to multiply tabular statements of statistics. The facts might easily be given in the body of the Report.

3. *Deaths.*—In respect of deaths also the towns show a lower ratio than the province generally. The provincial rate, as we have already seen, was 32·52, for the towns it was only 29·92. In some of them it is suspiciously low, under 20 per 1,000; in others again it rises to nearly 50, and in one reaches the maximum of 58. In the districts we find great extremes also, though not so great as in the towns, between 20 in Bilaspur and 43 in Saugor. If the highest and lowest rates of the rural circles in each district were shown, the extremes in the country would in all probability be found to be as great as in the towns. It is very desirable that, in future reports, some details should be given on this point. We have already expressed our opinion that they should be furnished in respect to births, and it is still more important that they should be furnished in respect of deaths, not only because without such data it is almost impossible to judge of the accuracy of the registration, but also because attention will thereby be directed to those localities where the mortality is highest, and where sanitary improvements are therefore most urgently called for.

2. *Registration as compared with other Provinces.*—The Central Provinces, as their name implies, occupy such a central position in India, surrounded on all sides either by other provinces or Native States, that this seems a fitting place for comparing the results in all those parts in which registration is carried out. From the Native States little information is available. The data procurable as regards both births and deaths are summarised in the following statement:—Even in some of the provinces under our rule the returns are evidently most defective, but it seems better to give them in full than to attempt to eliminate those that are seemingly untrustworthy. In respect of births, Bengal, Coorg, Burma, and Rajputana may be set aside. Among the others the birth-rate varies between 30 in Assam and 42 in the Hyderabad Assigned Districts. The Central Province rate (38) is exactly the same as that of the Bombay Presidency, and both of them are exceeded by the North-Western Provinces (39), the Punjab (39), and the Hyderabad Assigned District (42). The death-rates of the Punjab and the Central Provinces are the same (32), and both are exceeded by the Hyderabad Assigned Districts (35), by the North-Western Provinces (37), and by the Punjab, which heads the list with a mortality of 46 per 1,000.

	Per 1,000 of Population.							
	Births.	Deaths from						
		Cholera.	Small-pox.	Fevers.	Dysentery and Diarrhœa.	Injuries.	All other Causes.	All Causes.
Madras	31	1·2	1·0	9	·9	·4	10	22
Bombay	38	·2	·1	20	2·1	·3	4	28
Bengal	*21	2·2	·19	17	·65	·44	3	24
North-West Provinces	39	1·8	1·26	28	1·22	·60	4	37
Punjab	39	·18	·47	36	·91	·30	8	46
Central Provinces	38	·54	·26	21	2·0	·55	7	32
Hyderabad Assigned Districts	42	·3	·1	18	5·	·4	11	35
Rajputana†	25	·8	·6	14	2·8	·66	2	22
Coorg	15	·03	·1	21	1·3	·2	2	25
Assam	30	3·4	·3	16	2·8	·3	6	29
Burma‡	23	·2	1·0	8	·8	·19	6	17

* Registration confined to municipal towns. † Registration confined to the Ajmere and Merwara districts.
‡ Lower Burma only.

5. *Mortality according to Age.*—In the above table we have distinguished the mortality attributed to each registered cause, as these details are very useful for comparison, and some of them will be referred to hereafter. There is also another item in respect of which a comparison of provincial ratios will be of use in endeavouring to arrive at correct conclusions, and that is the mortality according to age. There can be very little doubt that in India more even than in European countries the mortality falls heavily on young children, and as this is the chief point in regard to which we are anxious to bring out the facts, we shall limit the comparison to the deaths among infants under one year and to children between one and five years of age.

	Mortality per 1,000.					
	Under 1 Year.		1 Year and under 5 Years.		Total at all Ages.	
	Male.	Female.	Male.	Female.	Male.	Female.
Madras	173	147	34	32	23	22
Bombay	231	198	60	56	28	27
Bengal	186	152	28	25	26	22
North-West Provinces	348	316	72	68	38	36
Punjab	318	305	115	113	45	48
Central Provinces	336	287	39	33	34	30
Hyderabad	308	256	91	79	36	34
Rajputana	114	100	41	39	22	21
Coorg*	—	—	—	—	23	27
Assam	205	169	27	26	31	28
Burma	142	108	22	19	18	16

* Not given in detail.

We fear that in regard to many of the provinces the main conclusion to be drawn is that the statistics are still lamentably incorrect. Even if the comparison be limited to those in which registration has made most progress—the North-West Provinces, Punjab, Central Provinces, and Hyderabad—although all agree in fixing a very high death-rate for infants under one year, the anomalies are very striking. The rate varies among male infants from 308 in Hyderabad to 348 in the North-West. We have the further and remarkable result that the mortality among female infants is in all of them less, and in some of them greatly less, than it is among male infants. But it is among children between one and five years of age that the differences are most extraordinary. In this class again the higher ratios are invariably among boys, and we have the great extremes of 39 per 1,000 in the Central Provinces and 115 in the North-West.

6. *Improvement of Registration and the New Census.*—It will thus be seen that, even in those provinces where registration has made most progress, and among these the Central Provinces finds a place, there is still a vast deal to be done to attain accuracy. It is only by constant inspection, as we have repeatedly urged, that this result can be achieved. This would seem to be done in the towns of the Central Provinces, as evidenced by the long list of fines inflicted for breaches of the municipal byelaws on the subject, but nothing is said of the system of check adopted in rural tracts. The Census of February 1891 has afforded a new starting point for the vital and mortuary statistics, not only for producing better results in the future, but also for checking those of the past 10 years, and testing how far the population in each district and municipality, as shown by the census, agrees with the result arrived at by adding all the births and deducting all the deaths which have been registered during that period.

7. *Chief Diseases. Cholera.*—The portion of the total mortality due to the chief diseases has already been shown in the general table given in paragraph 4, where the results in the Central Provinces for 1890 have been detailed and placed side by side with those in other parts of India. There are several points in the history of the cholera of the year which are of interest. The Sanitary Commissioner has shown what has been the experience of the province in respect of this disease during a series of years. In one table he has given the actual number of deaths from it during 10 years, with the ratio in each, and in another table he carries the comparison by these ratios over 16 years. In both the contrasts are very remarkable. In 1884 only 149 deaths from cholera were recorded over the entire province; in 1889 the number was 52,588. If we take the ratios over 16 years we find that they varied between a fraction, 0·04 in 1880, and the high figure of 5·76 in 1889. In some of the years, in fact, cholera was dormant and almost altogether absent; in others it was more or less active. We may thus conclude from these results that the cause or combination of causes which produce cholera varied year by year in a corresponding degree. In some they existed to a marked extent, in others again they were much less, and in some few they hardly existed at all. In 1890 they were but slight, but they were widely spread; every district but one was more or less affected, and that was Balaghat. Only one district suffered much, and that was Narsinghpur, where the deaths equalled 4·23. In many of the other districts they were very few, and the total for the province amounted to 4,787, yielding a ratio of ·54 to the whole population. The widespread character of the epidemic causes and, at the same time, their diminished power, as compared with many other years, is well illustrated by the fact that, although 80 of the circles of registration out of 160, or just one-half, returned deaths from cholera, these were limited to 623 villages out of a total of 29,012 villages in the province. The District Sanitary Reports do not add much to our knowledge. They seem to be chiefly occupied with a discussion of the question whether the disease was imported into the several places where it appeared or was not imported. On this point the opinions vary much. In some details are given to prove that travellers or others coming from a locality already affected were the cause of an outbreak; in others no evidence of the kind is forthcoming. It would seem that far too much importance has been and is attached to this particular point in Sanitary Reports. In such reports the great aim should be to discover disease causes which can be dealt with, and either altogether removed or at least remedied. But, unless the whole commerce and social life of a province is to be brought to a standstill, it is not possible to control the movement of the people from one village to another or from one district to another. Any attempt of the kind would involve an army of police, with an enormous expenditure, it would be regarded by the people as a grievous oppression, and it must end in failure. We do not for a moment suppose that any Government in India would think of anything of this kind. We have drawn attention to the subject merely in order to show that, whatever scientific interest may attach to the theory of importation as the cause of cholera, this question, especially in a country like India, is altogether outside the pale of practical sanitary action. Instead of investigating supposed cases of importation, it is therefore much more important that Civil Surgeons and all others connected with the Health Department should search out those local sanitary defects which favour disease, and which can be dealt with. In many cases it may be difficult, and perhaps impossible for the present to deal with them satisfactorily, but it is none the less necessary on this account to keep them prominently and constantly in view.

8. *Small-pox.*—The record under the head of small-pox was particularly favourable. The number of deaths was 2,265, a ratio of ·26 per 1,000, the lowest of the last 18 years, except 1881, when it was only ·21. In these other years, beginning with 1873, it has been as high as 3·44. This was in 1879. If we look at the district rates, we find that in 1890 they ranged between 0·05 and 1·31. One-third of the total small-pox deaths were in children under one year, and if to these be added the deaths among children between one and five years of age, we have a total of 1,613 deaths among children out of the 2,265 deaths at all ages.

9. *Vaccination.*—We may here conveniently consider the facts recorded in the Vaccination Report of the Central Provinces. This report is for the year 1890–91. The statistics show that this part of the work of the Health Department was carried on with great activity. The total number of persons vaccinated was 435,981, or 39,397 more than in the previous year. If re-vaccinations be excluded, the excess was 37,078. The number of successful primary vaccinations was 374,946, or an excess of 35,985 over the figures of 1890–91. The percentage of success recorded was 96·39. The operations performed on infants and children under five years both show a large increase. To these totals are to be added the dispensary vaccinations. Of these there were 12,955 primary cases, of which 9,308 were performed on infants. The percentage of success in re-vaccination cases (77·87), although less than in the previous year, was still high. These results evidence, as we have already said, decided activity, and the large number of inspections made both by Civil Surgeons and the Native Superintendents of Vaccination, show that steps are taken to check the returns. The only real test, however, of the actual protection afforded by the vaccinations is the concurrent history of small-pox and vaccination in each district over a series of years. It would be easy to give for each of the districts the annual mortality from small-pox for, say, seven years, and underneath these figures the annual proportion of persons protected by vaccination during each of these years as recorded in the Vaccination Reports. A shorter period would hardly suffice, but the exact years taken for comparison should move on in each report, so that they may serve as a current test of the work.

10. *Fevers.*—Under the head of fevers the ratio per 1,000 of deaths registered was 21 out of a total mortality from all causes of 32. Notwithstanding an epidemic of influenza, the deaths from which, no doubt, found a place in this category, the general result is more favourable than usual.

The table devoted to the monthly incidence of the deaths and their distribution by districts brings out the fact that the maximum mortality occurred in May (24,566) and the second highest mortality in April (21,916). In the autumn months, when fever deaths are generally much more numerous than at any other time of the year, the highest total for the province was 19,490. This is true, not only for the province as a whole, but for most of the districts taken separately. It seems, therefore, more than probable that the fever deaths recorded in April and May were largely due to influenza, but the only notice of this epidemic which we can find is the casual remark that "the deaths which occurred "among the very young, the aged, and debilitated from influenza in the first half of the year would "be classed as the result of fever." As we have pointed out in noting on other reports in which there is a similar want of information regarding this great and unusual sickness, steps should have been taken to collect data from every district, so that at least the more important facts might be recorded. The sanitary history of a year in which an epidemic of influenza—causing, as it would appear, such widespread sickness, and adding so much to the mortality—is the most remarkable feature, is altogether incomplete without a full history of it. We find that the district ratios of fever mortality vary between 7·40 in Sambalpur and 31 in Nimar. In neither of these was there a rise in the deaths during April and May, but in most of the districts which record a high ratio of fever deaths during the year the rise in April and May was marked. The death-rate from fevers in the Central Provinces during 1890, although, as we have already said, it compares favourably with that of previous years, is still greater than what it was in most other parts of India. It is, in fact, exceeded only by the North-Western Provinces (28), and by the Punjab, which records the maximum of 36.

11. *Dysentery and Diarrhœa and other Causes.*—The Central Provinces and most of the other provinces have adopted the new heading of "Dysentery and Diarrhœa" in place of "Bowel Complaints" prescribed by the Government of India. Under this new heading the mortality shown is less than it was under the old heading in former years, but it does not appear how much, if any, portion of the diminution is due to the change of the heading. As compared with 1889, the diminution is to be found, not only in the province as a whole, but also in all the districts, with the single exception of Nimar. "Injuries" and "All other Causes" complete the divisions of death causes in the Registration Statements, and some particulars regarding them are exhibited in Table VI. Under "Injuries" there are no very marked variations, the total ratio of ·55 for the province is distributed as ·60 for the towns and ·54 for the country. But under "All other Causes" there are extraordinary fluctuations. The district ratios, for example, range from 1·14 in Seoni to 18·52 in Betul. Among the towns we have it as high as 27·05 in Narkher in the Nagpur district, and in Bunkheri in the Hoshungabad district there is the opposite extreme, for here not a single death was recorded under this head. In this place the population is small, and therefore hardly suitable for comparison, but in the neighbouring town of Harda, which numbers 11,203 inhabitants, the deaths registered under "All other Causes" equalled only 0·53, a wonderful contrast to 27·05 recorded at Narkher. We are well aware of the great difficulty of obtaining accurate or even approximately accurate statistics of the *causes* of deaths in Indian villages and towns, but the first step towards improvement is to realise obvious errors, and to draw attention to them.

12. *Sanitary Defects.*—On this most important point the chief information given is contained in the statement or "Sanitary Estimate," as it is called, which was prescribed by the Government of India, and which appears in paragraph 46 of the Report. But the information it contains is meagre. In regard to many places, the columns designed to show the condition of "drainage," "water," and "domestic cleansing" are blank. Such is the case in respect of the two chief towns of the Province. Nagpur and Jubbulpur, opposite each of which all that is said is "Estimate not furnished," but even where entries are made they are nearly always confined to such general descriptions as "Bad" and "Fair." We observe that the Sanitary Commissioner, after his inspection of towns, prepared a memorandum showing the special sanitary defects of each in regard to all such matters as drainage, water-supply, conservancy, disposal of the dead, &c. These memoranda were addressed to the municipal committees, and "the action taken on the various points noted in them was submitted for the orders of the Chief Commissioner." In a similar way "the inspection of the smaller towns and "villages is carried out by Civil Surgeons in their respective districts, and Civil Surgeons in like "manner called attention to those defects which appeared to be readily removable, and the action "taken by local bodies was duly reported to the Government." These reports must be valuable, and contain just the information we are anxious to obtain, a statement, in fact, of local disease causes and the steps which are being taken to remove them. We would therefore suggest for the consideration of the Government of India whether the "Sanitary Estimate" might not with great advantage be amplified so as to include a summary of all such inspection reports. We have elsewhere suggested the addition of columns to show the births, the deaths from cholera, and the mortality from all causes in each town and rural circle.

13. *Sanitary Works.*—With the exception of extending the water-supply at Nagpur to the suburb of Sitabuldi and some other parts of the town, no large work has been carried out, but the Sanitary Commissioner remarks that "in all districts some useful sanitary improvement has been effected in the large towns."

14. *Sanitary Board.*—The Provincial Sanitary Board, which held its first meeting in August 1889, held only one formal meeting during 1890, but they have initiated proceedings which will doubtless bear fruit in large projects of sanitary survey, water-supply, and drainage in the chief towns. A sanitary survey is necessarily the first work that engaged their attention, and such a survey had been commenced in the towns of Nagpur and Jubbulpur, which had both been supplied with waterworks,

but had no proper drainage. Other schemes of improvement were under preparation, including water-supply for Khandwa and Raipur, towards the last of which the chief of Nundgaon had most liberally promised to contribute two lakhs of rupees.

10th June 1892.

No. 7.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Assam for the year 1890.

Important Matters in regard to which further Information is desired.—This Report does not discuss the general causes which seemed to have been at work in affecting the public health during the year, such, for example, as the meteorological conditions and the prices of the common articles of food used by the people. There is no special place assigned in Sanitary Reports for the consideration of these important questions, and yet it is clear that no Sanitary Report can be complete which leaves them out of account. There is nothing more striking in the experience of the different provinces of India than the extraordinary differences between one year and another as respects the prevalence of disease. Some are remarkable for their healthiness, and others just as remarkable for their unhealthiness. So far but little light has been thrown on these very diverse features, but their importance cannot well be over-estimated as the groundwork for careful inquiry as to the causes which produce them. Why is one year healthy and another year unhealthy? The question is a very difficult one, and it may be long before a satisfactory and complete answer to it can be found. But the first step to it is to ascertain and record the great facts as fully as possible year after year, and among them none are more important than the two sets of facts which we have mentioned—the meteorological conditions, especially the amount and distribution of the rainfall by districts, and the food supply of the people. These are potent influences which must greatly affect the public health, and it is therefore essential that they, as well as any other general factors regarding which accurate data can be collected, should be fully and carefully discussed in all the Sanitary Reports, care being taken to avoid drawing conclusions too hastily. The observations must be carried over a series of years, and the more the results can be localised the more likely are they to lead to correct deductions. There is another field of inquiry peculiar to Assam, in regard to which each year might contribute interesting and useful information, and that is the amount of sickness and mortality among the immigrant population on their way up. These particulars, we understand, form the subject of a separate report to the Local Government, but it is very desirable that at least a summary of them should appear in the annual Sanitary Reports. Great importance has been attached to these new arrivals in their bearing on the health of the province. It has been frequently asserted that they are the agency through which it suffers from frequent cholera epidemics, and it is, therefore, most necessary for arriving at the truth in respect of this assertion that a complete account of the health of the immigrants should accompany the health history of the people generally.

2. *Births.*—The province of Assam, in its sanitary aspect, is divided into three portions. First, there is the valley of the Surma, with its two districts, Cachar and Sylhet; then Assam proper, divided into six districts; and, lastly, the Khasi and Jaintia hills, where the population amounts to only 43,254, among whom the difficulties of collecting statistics are great, and where registration has in consequence made comparatively little progress. The Sanitary Commissioner, in the statistical tables, and in his analysis of them, has very properly kept these divisions distinct, while he has at the same time considered the results of the province as a whole. Out of a total population of 4,881,426 all are included in the registering areas, except 354,467 inhabiting the Naga, Garo, and parts of the Khasi and Jaintia hills. During 1890, 138,826 births were registered, or in the proportion of 30·56 per 1,000, a slightly lower ratio than that of 1890, when it stood at 31·20. The provincial average is composed of 25·54 in the hills, 27·34 in Assam, and 33·82 in the Surma valley. The district ratios in each of the latter portions vary from 23·34 in Kamrup to 34·69 in Cachar. Six out of the eight districts show a diminution as compared with 1889. The low birth-rate is assigned to various causes—the prevalence of cholera in some districts, the increase of *kala-ozar* in others, and in others again to the imperfect records. The large excess of male over female births, and perhaps, even more than this, the great variety in the proportion of this excess in different districts, both point to serious defects in the registration. Throughout the province generally the male births were in proportion to the female births as 109 to 100, and, if we omit the hills, with their birth-rate of 25·24 and their 115·38 male births to every 100 female births, we have the general result of 109·06 male births per cent. of female births in the Surma valley, and 110·41 in Assam. Again, the district rates in Assam vary in a remarkable manner. In it, for example, there are two districts in which the percentage of male births (115) is just as high as it is in the hills, and this fact alone tends to throw doubt on the opinion of the Sanitary Commissioner that the low birth-rates in some of these districts was due to sickness. We are inclined to believe that the registration of births throughout the province is still far from accurate, and this conclusion is borne out by the very small number of births recorded in the town, as may be seen from the table given in paragraph 5 of the Report. The average birth-rate of the towns was only 22·46, and this average includes such extremes as 49 in one place and only 7 in another. The standard table relating to births shows only the facts recorded by districts, and it is not desirable, especially so long as the registration remains so

imperfect, that any further particulars should be attempted in it, but much light might be thrown on the state of the registration throughout the province if in the body of the Report the maximum and minimum were shown in every district among the registration circles, both town and country; and this suggestion might be adopted with advantage, both as respects deaths and births. We do not expect to find uniformity, in fact uniformity would, to a great extent, be in itself evidence of error, but an average is apt to mislead, unless we know of what extremes that average is made up.

3. *Births.*—The mortuary statistics of the year have been fully examined by the Sanitary Commissioner, and we need only refer to the main facts. The most important of these perhaps is that the mortality was only a fraction (·92) less than the birth-rate. Yet it was slightly less than it had been in 1889—29·64 compared with 30·70, and it was considerably lower than that of several of the other provinces during the year under report. The Central Provinces return 32, Berar returns 35, the North-West Provinces 37, and the Punjab 46 per 1,000. If the three natural divisions of which Assam is composed be taken separately, we find that in the hills there was practically no change in the two years, but in the other two the changes are very marked. In the Surma valley the death-rate fell from 32·25 in 1889, to 27·14 in 1890, whereas in Assam it rose from 29·18 to 32·23, and this rise was distributed over all the districts but two. It is in great measure to be attributed to cholera. This we shall see more particularly in a subsequent portion of this memorandum, but we may mention here, in general illustration of this fact, that in the Surma valley the deaths from cholera fell from 11,270 in 1889 to 3,685 in 1890, whereas in Assam they rose from 7,001 to 11,685. A further cause of rise in Assam was increased prevalence and extension of *kala-azar*, a peculiar malady which has attracted much attention of late years, and regarding which a separate report has been submitted by Surgeon Giles. The heaviest death-rate (36·37) was in Sibsagur, due mainly to cholera, and the lowest (26·29) in Sylhet. In Table VI. of the Appendix there are examples of much greater extremes. In one town, which is a striking instance of neglected registration, the mortality appears as only 1·45 for the year; the next lowest is 16·32, and the highest 52·62. The ratios of male to female births in the town, especially when taken side by side with the ratio of male to female deaths, yield some startling results. The number of males born to every 100 females born varies from 58 to 195, and the number of males died to every 100 deaths of females vary from 135 to 391. These manifest defects have been brought to notice, and it is to be hoped that the renewed orders which the Chief Commissioner has issued on the subject may lead to greater accuracy.

4. *Deaths in Dispensaries.*—In reviewing the mortality in the towns the Sanitary Commissioner gives two sets of ratios, the one including, and the other excluding, the deaths which took place in the dispensaries. The idea, no doubt, is that many of these deaths occur in persons who have been brought from other places, and who therefore do not properly form part of the town population, but this mode of calculation seems peculiar to Assam, and until the mortuary registration attains a much greater degree of accuracy than it now possesses it seems hardly required. To keep up the necessary records for the purpose must involve considerable labour, especially if an accurate account is kept of those deaths which ought to be entered against the town and those which ought not. Until greater accuracy is secured in the main facts of registration, such attempted refinements tend only to cause complications. The simpler the facts are put the better. The statistics of 1890, as in the other provinces, are based on the Census of 1881, and next report will, we hope, contain more useful information based on the new census, by means of which the birth and deaths recorded in the intermediate 10 years may be tested, and a more exact basis formed for the examination of these statistics in subsequent years. The considerable immigration which takes place annually, both to the Surma and Assam valley is, as we have already said, an important element in the population of Assam, and it is therefore desirable that the extent of this addition should be recorded year by year in the Sanitary Reports.

5. *History of the Chief Diseases. Cholera.*—During the year 15,396 deaths were attributed to cholera. The disease, which had been very prevalent during the previous year in the Surma valley, was in comparative abeyance in that part of the province during 1890. The totals for the two years are as follows for each of the three divisions :—

	Deaths from Cholera.	
	1889.	1890.
Surma Valley - - - - -	11,270	3,685
Assam - - - - -	7,001	11,685
Khasi and Jaintia hills - - - -	17	26

In 1890 the two districts of the Surma valley suffered in nearly the same proportion. In Assam, on the other hand, there were marked differences in the violence of the disease. In three of the districts it was severe, causing the deaths of several thousand persons in each, and contributing a death-rate from this cause alone of from 11·58 in Sibsagur, where it was worst, to 9·91 in Nowgong, and 4·89 in Kamrup. As may be seen from the cholera map, different portions of the same district suffered in very different degrees. The highest death-rate from cholera recorded in any one place was 20·96 in the town of Sibsagur. The appearance of cholera in this district is attributed "To the "cholera poison having been brought up to the Rajbari garden, six miles from Sibsagur, by new "coolies, as the disease first in this district showed itself in 1890 in that garden amongst a fresh "batch of coolies a few days after their arrival. These coolies had been landed at Dhubri where

" cholera was then prevalent, and were reshipped to Disangmukh, and then sent on to the garden." From this garden it is supposed to have radiated to the villages. The date of this first case is not given, and many other particulars are wanting, regarding which inquiry at once suggests itself. In turning to the table which is devoted to cholera in the Appendix, we find that in the month of January, when it may be assumed this first case occurred, there were 138 deaths from cholera registered in the six districts of Assam proper. Every one of these districts returned deaths from this cause in that month. As we follow the epidemic in the succeeding months there is a marked similarity in its synchronous rise and fall in the different districts, and one remarkable feature in connexion with the supposed history of importation from Bengal is the fact that the district of Goalpara, which lies nearest to Bengal, and therefore most exposed to any danger from immigrants, hardly suffered from cholera at all during 1890. There were only 128 deaths in the whole district out of a population of 446,232, or the equivalent of ·29 per 1,000. Dhubri, where the coolies in question were first landed, and where apparently, it is believed, they contracted the disease, is situate in this district of Goalpara. We have failed to discover any evidence of cholera having been prevalent, as is stated, in or around Dhubri in the beginning of the year. The first case noted in those parts is in February (no date given), whereas the first case in the Sibsagur district with which the history of supposed importation is concerned, occurred in January. We have entered at some length into this history, because there seems to be a tendency on the part of reporting officers to come to hasty conclusions on this matter without full inquiry into the facts. Supposed importation offers, no doubt, to some minds a very easy solution of all the difficulties connected with the origin of epidemics, but, especially in India, it affords no basis for practical measures calculated to prevent them.

6. *Sanitary Defects in connection with Cholera prevalence.*—In speaking of Kamrup, the Sanitary Commissioner expresses an opinion which is somewhat at variance with the supposed history of importation. He says, cholera " is always more or less endemic in that district. The cause of this " seems to be connected with its being generally more or less below the level of the Brahmaputra, " which in and about Gauhati is very remarkable, and also to the very alluvial and clayey nature of " the upper soil and the stiff red clay of the subsoil, from which conditions this district is generally " waterlogged in the rainy months, and is always damp." Dr. Costello is fully alive to the importance of sanitation as the great preventive of cholera, and cites numerous illustrations in proof of this opinion. In Sibsagur, for example, speaking of the high death-rate in the villages as compared with the tea gardens, he says that the result was apparently due " to the absence of sanitation in the villages, " and its presence to some extent in the gardens "; and again " the one thing which is quite certain " as to this epidemic in the Sibsagur district is, that its spread, especially in the villages, was due to " their insanitary condition, and that with better sanitary conditions the incidence would have been " less." The prevalence of cholera in the Nowgong district is attributed to the insanitary condition of the villages, " especially as regards the absence in them of good and protected wells and " the consequent great impurity of the drinking water." In the town of Sibsagur, which, as already shown, furnished the highest death-rate in the province, it is said, " neither the drinking water-" supply, the conservancy arrangements, especially as regards privates latrines, nor the drainage are " in as good order as at Nowgong . . . . The respectable natives have private latrines where " the excreta are conveyed into dumb wells or cesspools; these are never emptied." We have spoken of the better state of things in the tea gardens than in the villages, but the description which Dr. Giles gives of the gardens in his special report on *kalar-azar* is by no means flattering to the gardens. After speaking of defects in houses, water-supply, &c., he thus refers to conservancy:— " In this matter the arrangements in use upon tea gardens may be very briefly described. There are " none. The entire neglect of this most essential of all sanitary necessities is the greatest blot to be " found in the condition of the tea gardens . . . . The existing state of things cannot be " described in too strong terms." He is referring more immediately to what he believes is the cause of the prevalence of *kala-azar*, but the extract is of value here as showing what room there is for improvement, not only in the villages of Assam, but also in the gardens, and this improvement is the great practical work to be done. There can be no question that even in a money point of view the planters would gain much by carrying it out.

7. *Small-pox* added but a small contribution to the general mortality, only ·3 per 1,000. In Cachar, where the disease was most prevalent, the ratio was ·92. In three of the districts not a single death was reported under this head, and the total deaths throughout the whole province numbered only 1,401. If we compare this result with what happened in the other provinces, we find that it is very favourable to Assam, for only four of the others return a smaller death-rate from small-pox. In Madras and Burmah the rate was 1 per 1,000, and in the North-West Provinces, which furnish the maximum, it was 1·26. Compared again with other years in Assam, the experience of 1890 was also favourable. In 1889 and also in 1888 the small-pox deaths exceeded 2,000 for each year. The quinquennial period, 1884–88, which is given in the body of the Report, yields an average also of over 2,000 annual deaths, but, as we have already said in speaking of small-pox, in reviewing several of the other reports, the figures for each year should be recorded separately, as well as the averages for the period. The returns from the towns in respect of small-pox are extraordinarily favourable, so much so, indeed, as to throw much doubt on their accuracy. It is hardly credible that of 20 towns enumerated in Table VI., with an aggregate population of about 100,000, only two recorded any death from small-pox during the year. The total deaths from small-pox in these towns amounted to only nine, of which one occurred in Silchar and eight in Sunamganj. Both of these towns are in the Surmah valley. In the 12 towns of Assam proper, with an aggregate population of 61,358, not a single death from small-pox was recorded during the year. The Sanitary Commissioner claims the

result as conclusive evidence of the advantages of compulsory vaccination in these areas, especially when contrasted with the small-pox mortality in the rural circles; but having regard to the inaccuracies manifest in the town registration as respects other points, we are hardly inclined to accept the conclusion without further proof. From the dispensary returns we learn that 58 cases of small-pox were treated during 1890 at these institutions, of which only eight were admitted in the Sadr towns.

8. *Vaccination in relation to Small-pox.*—The doubt above expressed renders it all the more necessary that the connection between small-pox and vaccination should be worked out more fully than is usually done, so that clear comparison may be made between the extent of vaccination in different well-defined localities, and the extent of small-pox mortality within the same area over a series of years; but in order to make the comparison worth anything, both sets of data, the vaccination returns and the mortuary registration, must be at least fairly accurate. In the separate Vaccination Report for 1890-91, which may be conveniently considered in this place, details are furnished of the work done in different municipalities and stations, but in only one instance, apparently, are the operations among children distinguished from the others. If we take the registered births throughout the province as the basis for comparison in the important matter of infant protection, the figures stand thus for 1890:—

Births registered - - - - - -	138,326
Infants under one year successfully vaccinated - - -	14,481

After making full allowance for deaths in the early months of life, this is but a small portion of the whole, and it must be remembered that while the successful vaccinations are not likely to be understated, the number of births registered is probably much short of the truth. At the same time the prejudices of the people against vaccination must be considered as a serious difficulty with which the Department has to contend. The figures for 1890–91 show gratifying progress over those of the previous year.

9. *Fevers.*—The mortality recorded under this head in 1890 was almost the same as it had been in 1889, 16 per 1,000. This is not a high ratio compared with that of other provinces, seven of which suffered from fevers during 1890 to a greater extent than Assam, varying from 17 in Bengal to 36 in the Punjab. It appears, however, that the fever death-rate in Assam has been rising much of late years, and this the Sanitary Commissioner attributes to the increasing prevalence of a disease which appears to be special to the province, and has been known under the name of *kala-azar*. The district mortality from fevers varied much. In both the districts of the Surma valley it was 12 per 1,000, but in those of the Assam valley it varies between 11 in Lakhimpur and 28 in Goalpara. In the towns the rates are still more remarkable for their extremes, from 1 in Balaganj to 49 in Barpeta. It is incidentally mentioned that influenza prevailed in some parts of the province, but there is no general account of the epidemic, an omission which is to be regretted, as information in regard to this widespread epidemic would have been of great interest.

10. *Kala-azar.*—The conclusion at which Surgeon Giles has arrived as the result of his careful investigations is that this disease, which has proved so fatal in the province, is caused by an animal parasite which multiplies in the intestines of those affected, that it is spread entirely by their dejecta, that little or no benefit is to be derived from medical treatment, and that "there is only one possible "way of dealing with the disease, and that is to no longer allow the general fouling of inhabited "sites, in other words, to adopt ordinary measures of conservancy." He believes that kala-azar is the same disease as the beri-beri of Ceylon, with further complications added arising from the malarious character of Assam; that both are cases of *anchylostomiasis*, under which name cases of *kala-azar* ought, he thinks, in future to be known. A belief is expressed that the disease "has been imported "into Assam by coolies from the recruiting districts," but we cannot discover any facts which seem to warrant this conclusion. The practical measures to be taken in the way of prevention are the important point, and these are summarised by Surgeon Giles as follows:—

For Villages.

(1.) The adoption and enforcement of some simple means of conservancy.
(2.) Migration from infected cities when practicable, or, failing the possibility of that, their disinfection, either by—
  (*a*) prolonged exposure to the direct rays of the sun; or,
  (*b*) exposure to a temperature of over 140° F.; or,
  (*c*) burying;
  by any of which means the embyros are killed.
(3.) Improvement of the water-supply.
(4.) Clearing and draining of village sites.

For Tea Gardens.

(1.) Improvement of proper conservancy;
(2.) Removal of lines to new site; or,
(3.) Disinfection of existing site;
(4.) Adoption of raised huts;
(5.) Prohibition of enclosures round huts;
(6.) Prohibition of cattle keeping within coolie lines;
(7.) Proper water-supply; and
(8.) Provision of green vegetables for the coolies.

These are all measures of general sanitary improvement, which would, no doubt, tend greatly to improve the health of the people, whether dwelling in villages or in tea gardens, and it is therefore highly desirable that they should be carried out. No orders had yet been issued on Surgeon Giles' report. We hope that it may be found possible to carry out his suggestions, if not over the whole province, at least in certain selected villages and tea gardens, where their enforcement could be secured and the results carefully watched.

11. *Deaths due to other Diseases and all Causes.*—The deaths recorded under the other heads of registration do not call for special remark. The substitution of "Dysentery and Diarrhœa" for the old heading "Bowel Complaints" was to take effect from the beginning of 1891. The general results for 1890 are summarised in the following statement :—

1890.

Population according to Census of 1881 - - - 4,526,959
Births registered - - - - - =30·56

Causes of Death.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	15,396	3·40
Small-pox	1,401	·31
Fevers	74,779	16·52
Bowel complaints	13,015	2·87
Injuries—		
Suicide	108	—
Wounds and accidents	1,259	—
Snake bite or killed by wild animals	362	—
Total injuries	1,729	·38
All other causes	27,875	6·16
Total from all causes	134,195	29·64

12. *Sanitary Works.*—No great works were carried on during the year. Of the total income of Rs. 1,63,260, the municipalities expended Rs. 7,366 on drainage, Rs. 15,256 on water, and Rs. 30,555 on conservancy. Want of sufficient funds seems, at least for the present, to be an insuperable barrier to the execution of anything beyond minor improvements. The one exception seems to have been the case of Gauhati, to which the Chief Commissioner has lent Rs. 5,000 for the improvement of the filter beds. The Sanitary Commissioner condemns the whole water scheme of which these beds form part, on the ground that the supply ought to have been drawn at a point of the river higher up, and thinks that it is only throwing away money to spend more on trying to mend matters, but it would appear that all the objections against the scheme were fully considered before it was sanctioned, and that the municipality could not have borne the greater burden on their finances which the taking of the water from a higher point on the river would have involved.

13. *Sanitary Board.*—An account of the proceedings of the Sanitary Board is given in Appendix B., but it is not said how the Board is constituted, or what meetings it held during the year. The account is drawn up by the Sanitary Commissioner. It records that, under the orders of the Chief Commissioner, an attempt was to have been made to begin village sanitation in selected villages near district or sub-divisional head-quarters, which could be constantly supervised by the district officers concerned, and that sums of money were set apart for this special object. The main improvements were to be directed to water-supply, drainage, and conservancy. This scheme, it appears, was begun in certain districts, but progress has not been satisfactory. As regards municipalities, a sanitary survey was made of each, and its sanitary wants were ascertained, with a view to their being supplied as funds will admit. All the funds available would seem to be Rs. 1,63,260 already mentioned; of this, Rs. 94,060 are accounted for as spent on sanitary works, but roads and bridges took up about a third of this sum. The Sanitary Commissioner is of opinion that, in spite of financial difficulties, a good beginning had been made.

10th June 1892.

No. 8.

Memorandum by the Army Sanitary Commission on the Rajputana Sanitary, Vaccination, Dispensary, and Jail Report for 1890.

Rainfall and Price of Food.—In the sanitary history of Rajputana during 1890, the most important general facts mentioned in connection with the public health are, first, that the rainfall generally was below the average, and that in Ajmere the deficiency was so great, amounting as it did to nearly ·9 inches compared with the average of the previous six years, that the lake and wells had not been filled and a scarcity of water was apprehended; and, secondly, that the price of food was much the same as it had been in the year previous, less than it had been in 1887 and 1888.

Vital Statistics. Births.—The Report deals with the vital statistics in two distinct parts. First, there are the statistics of the Ajmere and Merwara districts, under British rule, with a population of 460,722; and then there are the statistics of three Native States (Ulwar and Dholepore and Jhallawar) and of 16 cities belonging to these and other Native States, with an aggregate population of 1,758,256. The statistics of Ajmere and Merwara are shown in a series of tables, the same as that adopted in the Provincial Sanitary Reports. It is not necessary to examine them very closely to see that the registration of both births and deaths has been very defective. The average birth-rate is returned as 25·26, but this average is made up of such extremes as 12 in the town of Ajmere and 43 in the town of Nusserabad. The proportion of male births to female births is as 124 to 100, and here again there are marked differences, such as can hardly be due to any other cause than defective registration. In two places the male births fall below the female births, but in all the others there is an excess of male births, amounting in several to over 130 males per cent. of females, and in one there is the maximum of 156 males born to every 100 females. Regarding births in Native States, we learn that the average ratio for those parts of them from which returns were available was 19·71, but this average is made up of such remarkable variations in different places that it is of little value. In Bikanir city only 22 births were registered altogether in a population of 43,283, or an equivalent of 0·51 per 1,000. In Burtpore city, on the other hand, the registered birth-rate was over 66. The system of registration is new to Native States, and little accuracy is to be expected for some time to come. Meanwhile it is important to point out defects, and to show what can be done in obtaining more trustworthy records in those districts of Rajputana which are directly under British rule. From this point of view, the returns of Ajmere and Merwara are disappointing, especially those from the town of Ajmere.

3. *Deaths.*—In the Ajmere and Merwara districts the recorded mortality equalled 22·11, varying from 16 in Jawaja, and 17 in the town of Ajmere, to 30 in the town of Nusseerabad. In every part the male deaths exceeded the female deaths. The general proportion was 126 to 100, but the 126 is the average of local ratios varying from 105 to 190. The Native States return a mortality very nearly the same as that of Ajmere and Merwara, but the extremes of which it is composed are much greater. In the State of Jhallawar there is a minimum of 6, and in a small town of Oodeypore a maximum of 53. We would not have it inferred from anything we have said here, or in reviewing the vital statistics of other provinces, that great variations in the death-rates, or even in the birth-rates of different places, are to be taken as in themselves evidences of inaccuracy. Much depends on the localisation of disease, and on local sanitary conditions. We know from experience in the case of both troops and prisoners in India that neighbouring places and bodies of men located, even close one to another, often suffer from sickness in very varying degree, and were the returns from different cities and rural circles all to indicate much the same death-rate we should be inclined from this fact alone to look on them with suspicion. All we mean to insist on is, that the only proper check on the registration is continual investigation on the spot, and that wherever high or low rates of mortality are recorded they call for all the more strict examination in order to ascertain if they are correct, and if so, on what causes they seem to depend.

4. *Diseases chiefly causing Mortality. Cholera.*—Fevers, bowel complaints, and all other causes in the Ajmere and Merwara districts during 1890 contributed very much the same number of deaths as they did in 1889, but under both cholera and small-pox there was a remarkable alteration. The cholera deaths increased from 55 in 1889 to 408 in 1890, and the small-pox deaths decreased from 1,686 to 313. Among the population of Native States the cholera deaths as shown in the statement given in paragraph 6 amounted to 1,768, but the more complete return in paragraph 11 records the number as 2,338. No cholera map is appended to the Report. To furnish such a map as that supplied in the Provincial Sanitary Reports, with detailed information as to the date of first cases and the mortality in each circle of registration, would not be possible in the case of many of the Native States in which registration has not yet become general, and such elaboration is not desired. It would, however, be of great assistance in inquiring into the history of cholera over India every year if a simple map were furnished from Rajputana, showing generally those parts which suffered much and those which either suffered little or escaped altogether. The geographical position of Rajputana in respect of cholera epidemics is one of great importance.

5. *Small-pox and Vaccination.*—As we have already stated small-pox during 1890 was comparatively in abeyance. It contributed ·68 to the death-rate in the Ajmere Division. In no part of the division was the disease severe. The figures for the previous five years are not given separately, but for that period as a whole the average annual small-pox mortality had been 2·27. In the statements devoted to vaccination at the end of the Report, particulars are given not only for Ajmere-Merwara but also for the different Natives States, and the amount of work done was large. Of 12,063, successful primary operations in Ajmere-Merwara, 8,089 were in children under one year of age. In the Native States 121,764 more such infants were operated on with success. The returns were verified to a large extent by actual inspection. It would appear from the table in paragraph 68, that in Ajmere-Merwara 40 per cent. of the cases were seen by the Superintendent or Native Superintendent. In the States this verification extended to 53 per cent. of the total cases operated on.

6. *Sanitary Works.*—We should have been glad to have had more information regarding the condition of the town of Ajmere and other places as respects all points of sanitary interest, drainage, conservancy, &c., and we hope that this may be supplied in future reports. The new waterworks at Ajmere which opened in February 1889, we regret to observe, had not been altogether successful. The supply was deficient and the quality inferior. The construction of a new reservoir was under consideration. The Sanitary Commissioner thus summarises other improvements effected in this city

during the year. "The construction of new cesspools was prohibited, and several old ones were "replaced by movable receptacles. Many of the privies in private houses were rebuilt on better "principles. It was decided to improve all the public latrines, and several of them have been already "altered. Water-tight reservoirs have been placed at collecting stations for the reception of liquid refuse, "thus rendering it unnecessary for filth carts to enter the narrow lanes. Progress is being made, but "the conditions of the lanes and alleys in the city shows how much remains to be done." The extracts given from the Agency Surgeons' Reports show that in the Native States sanitary improvements are not being lost sight of. Surgeon-Major Hendley reports that "Steady progress is being made. . . . . "The railway conservancy line has been extended, 416,512 cubic feet of foul "earth and 855 dead animals have been removed from the town by it; 108,360 cubic feet of night "soil have been taken away and sold to the cultivators or trenched, and Rs. 557 have been realised "by the sale of it." At Jodhpore considerable improvements were effected in the water-supply and also in the conservancy, but the cultivators will have nothing to do with the night-soil. At Ulwar it is said that "much has been done of late years to improve the sanitary condition of the city." Similar reports are made regarding other cities. It is important also to note that "village sanitation "is not lost sight of. Efforts are made by the medical staff and by the vaccinators, and sometimes "by others interested in the subject, to bring its importance home to the headmen of villages, and "to the people generally."

7. *Jails.*—The returns from the Ajmere jail were very favourable. The death-rate was only 7·83 per 1,000. The rate for the jails in Native States was 42·09, but high as this is, when compared with that of Ajmere, it is not higher than what is often found among prisoners in many jails within British territory. We are glad to note that much attention was being devoted to improving the sanitary condition of the jails in Native States. The Report notes that "the conditions under which "the prisoners live have been greatly ameliorated within the last few years, and every year sees an "advance in the right direction. Ventilation, diet and clothing, and the general sanitary state of the "jails have all been largely improved, and crowding has been very much lessened. It is to be hoped "that during the present year overcrowding will be still further diminished." Overcrowding is one of the most potent factors of jail mortality, and requires constant watchfulness. A return to show the accommodation which each jail properly affords, the extent to which this proper number of prisoners was exceeded, not by the average number, but by the actual number, and the length of time the overcrowding lasted, would be a valuable aid in dealing with this formidable evil. The last report for Rajputana which we noted on was that for 1885, and we are gratified to see that Rajputana has continued to progress in its appreciaiton of the importance of sanitary work, both in the jails and in the towns and villages.

10th June 1892.

No. 9.

Memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of Coorg for 1890.

1. *Registration of Births and Deaths.*—This Report has been drawn up by the Civil Surgeon of Coorg. It deals with a population of only 178,302 in all, and therefore does not call for lengthened remarks. Much of what we have said in our memoranda on the other sanitary reports for 1890 is also applicable here, especially as regards the importance of using the census figures of 1891, not only as a means of testing the results of the vital and mortuary statistics of the past 10 years, but also as affording a new standpoint from which the registration may in future be rendered more accurate; the importance of localising the mortality and of considering any excessive death-rates in direct conjunction with the sanitary condition of the places concerned; and, lastly, the importance of testing the real protection afforded by vaccination by taking the work of the Department in well-defined areas over a series of years in connection with the small-pox mortality in these areas during the same years. The registration of both births and deaths in Coorg continued most imperfect. A birth-rate of 15·25 per 1,000 must be much under the truth. The deaths equalled 25·32. The Civil Surgeon observes that, "even allowing for unusual sickness during part of the year, the increased number of deaths registered "is probably due to the continued means adopted to obtain more accurate registration." This explanation, however, is hardly consistent with the fact that the births registered during 1890 were fewer than in 1889, and that in both years the rate was very low. In 1890 the recorded deaths were in excess of the recorded births by 10·07 per 1,000. In dealing with the statistics of Coorg there is but little means of comparing the results in different places, as in all the standard forms but one the province is dealt with as a whole. In No. VI., which is the only exception to this rule, the town of Mer kara is shown separately, and it appears that in this town the deaths equalled 32·12, while in the rural tracts, which include all the rest, they equalled only 25·07. It appears that there are six registration circles in Coorg, and we would suggest that in future each of these should be entered separately in all the forms. Some information regarding each of them is contained in a separate statement which has been prepared in accordance with instructions from the Government of India. This shows the death-rate from small-pox, from fevers, and from dysentery and diarrhœa in each circle of registration, but if the standard forms were filled up as we propose the separate statement would not be required for they would give all the data it contains and more besides.

2. *Chief Diseases. Cholera.*—The year was more than ordinarily unhealthy, especially during the early months, and this, as we shall presently see, was due in great measure to the prevalence of influenza. Cholera was almost entirely absent. It caused only five deaths, all of which occurred in the month of May. The account of these is as follows: "The disease originated in a camp of "Lambanies (travellers from the Wynad) in a village in the Kiggatnad taluk. A Coorg woman in "whose house the infected man took shelter was next attacked, and subsequently three Yeravas. All "the necessary precautions as to disinfection, &c. were taken, and no subsequent cases occurred." There is no cholera map with its accompanying statement as to dates and other particulars, and so it is not possible to form a very definite opinion on the facts. We should like to have known more clearly what occurred, what measures of disinfection or other procedure were adopted, and how it is possible to carry out such measures with promptness and efficiency in an Indian village. We do not object to any such measures of precaution where they can be carried out intelligently and without interference with the people, but we much fear that they are very apt to lead to such undue interference. Disinfection and isolation of the sick have done little to diminish cholera even among troops and prisoners, where everything has been carried out with the greatest care under the immediate eye of a medical officer. There is too great an inclination to trust to the protection which such measures are supposed to confer, and therefore to neglect those sanitary improvements in which we believe the only real protection is to be found. We observe in the proceedings of the Coorg Sanitary Board, which are appended to this Report, that when cholera was prevalent in South Canara in the end of 1888, it was suggested that "a camp should be formed on the frontier for the detention and observation of the large bodies of coolies flocking into Coorg," but the proposal was negatived. The ground taken for this conclusion was that such a proceeding would imperil the labour market. Experience has shown that it could have done no good, although if it had been adopted the escape of Coorg from cholera in 1889 would in all probability have been attributed to it. It would certainly have been attended with great hardship to the people concerned. Any such measures—which are really only quarantine under another name—ought on every ground to be prohibited.

3. *Influenza.*—The epidemic of influenza which occurred during the early months of the year was very severe, and as this Coorg Report is one of the few which makes any special mention of even the main facts of this great event in the sanitary history of the year, we shall here extract a part of paragraph 21, which is of much interest, "The general health of the district suffered in common with "the rest of India from the late wave of this disease which was prevalent during the months of March, "April, and May. The jail was severely affected, and a full description of the epidemic is given in "the Annual Jail Report. The mortality in the jail was *nil*, as it was possible to keep the cases "under strict supervision and medical treatment (good sanitation being also maintained), but in "Merkara and the districts it was very considerable. As is usual in influenza epidemics, the total "mortality was great, owing to the fact that nearly the whole population was affected. . . . . "The after effects, viz., severe pneumonia, bronchitis, and diarrhœa carried off a good many, "especially amongst the poorer classes. With regard to registration, it is evident that the largely "increased number of deaths ascribed to *fevers* was due to influenza, fever being a leading symptom "of the disease. With the advent of the monsoon the epidemic died out, and by July the general "health had resumed its normal condition." This extract shows what an important factor influenza was in the health of the people during 1890, and how valuable data collected from so wide an area as India would have proved in regard to this great epidemic, which was not confined to India, but affected a very large portion of the whole world.

4. *Sanitary Works.*—The Civil Surgeon inspected many places and gave much useful advice as to the removal of local unsanitary conditions. There is only one point under this head to which we would draw attention, and this is the duties of the sanitary inspector of the town of Merkara. The municipality proposed to abolish the inspector, but the Sanitary Board did not approve of this step. There seems little doubt that an efficient inspector is required to look after the drainage, conservancy, water-supply, &c., and it would appear that under such inspection the state of the town in these respects had been much improved. It is said that, among the other benefits conferred, "cases of infectious "disease, that would not otherwise have been discovered, have been brought to notice." We cannot agree that the search for cases of "infectious disease" ought to be entrusted to any inspector, more especially to one of the class of "good military pensioners of non-commissioned rank," such as was proposed for the permanent post. If work of this kind is to be done at all, it ought to be done by a well educated medical man of experience, who can recognise disease when he sees it, but there are few qualified medical men available for such duty, even in the large towns of India, and if there were, the cost would, in most cases, be altogether prohibitive. But, quite irrespective of the cost, we are strongly of opinion that nothing of the sort ought to be attempted. As the Civil Surgeon remarks, "The people dislike interference with their domestic arrangements," and if the inspector in Coorg had been active in searching their houses for cases of "infectious disease" we do not wonder that they were anxious to get rid of him. Nothing is more surely calculated to prevent real sanitary progress than all espionage and needless interference with the privacy of home life, which is so much prized in all parts of the world, and is so particularly sacred to the native of India. It may be argued that notification of "infectious cases" has been adopted in England, and that therefore it ought to be extended to India. But the circumstances of the two countries are very different, and even assuming that such notification in England has done good, it by no means follows that it would do good in India. On the contrary, we believe it is altogether impracticable in India, and that all attempts to carry it out there must do much mischief. We are anxious to lead the people of India to realise the benefit of true sanitary improvements, but we can do nothing more certain to set them against the whole system and make them abhor the very name of sanitation than oblige them to submit to domestic visitations,

made with a view to detect cases of sickness in their households, and especially among their women. The preventives we wish them to adopt against cholera, fevers, and all other diseases from which they suffer so much are good drainage, pure water, and efficient conservancy, and in the case of small-pox the additional preventive of successful vaccination. The finding of "infectious cases," is apt to lead to the forcible removal to a hospital of some member of the family who is ill of such a disease, and this they object to most strongly. Experience has shown again and again that the only result of attempting to hunt out cases, particularly of cholera, in private houses, is to create alarm and to lead to concealment, so that people are afraid to call in medical aid at the commencement of the attack, and delay till it is too late. We know not how far the municipal byelaws to which reference is made in this Report warrant interference with cases of "infectious disease" in the town of Coorg, or how far such interference is warranted by the byelaws of other towns, but we are satisfied that at least in India, the exercise of any such power is much to be deprecated.

5. *Sanitary Board.*—A Sanitary Board has been in existence since December 1888. It is composed of the Commissioner, the Executive Engineer, and the Civil Surgeon. Three meetings were held during 1890, at which the inspection notes of the Civil Surgeon and other matters relating to the sanitary condition of the province were discussed.

19th July 1892.

No. 10.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Madras for 1890.

Division of Report into Sanitary and Engineering.—This Report is divided into two distinct parts. First, there is the Report of the Sanitary Commissioner with the several sections as before, but with this, which constitutes the twenty-seventh Report of the Sanitary Commissioner for Madras, there is the second part of the volume, which comprises the first Report of the Sanitary Engineer to the Government of Madras. The change is not one merely of form. It indicates a new and most important departure in the sanitary work of the province, from which the greatest practical good is to be expected. The appointment of a separate sanitary engineer was not sanctioned till the beginning of 1890, and he did not enter on his duties till the 1st of April in that year. His report has therefore reference only to nine months, and is of necessity to a great extent merely preliminary. We shall refer to it again in its proper place, but mention it here because we regard the appointment of a special sanitary engineer and the preparation and submission by him of a separate section of the annual Sanitary Report as a step of the utmost importance, and one which might be followed with great advantage in other provinces of India.

2. *Sanitary Commissioner's Report. General Character of the Year.*—On the important subjects of meteorological conditions and the food supply of the people, the information given in this Report is much more full than in any of the other provincial reports. Not only are there tabular statements to show the amount of rainfall in each district month by month, but similar data are given also for previous years. There is also a tabular statement indicating the monthly price of the chief food grains in each district as compared with former years, and the facts regarding both rainfall and food prices are further illustrated by a series of diagrams in which the experience of the year under report in respect of both these important matters is compared with that of previous years. Throughout the province generally the rain was in less quantity than usual. In only four of the districts was it above the average, in 18 of them it was below the average, and in three of these, Madras, Malabar, and Chingleput, the deficiency was very marked. Rice, ragi, and cholum, which are the main food of the people, were all dearer than usual. The year was not healthy; sickness, especially such as was recorded under the general head of "fevers" was very prevalent, especially in April, May, and June, and the deaths under this heading were more numerous than had ever been before recorded. The Sanitary Commissioner thus sums up the general characteristics of the year:—"The mortality in "1890 was higher than in any of the five preceding years, with the exception of 1889, the increase "being chiefly due to an increase in the deaths from fevers and *all other causes*; the rainfall was less "than in any of the five preceding years, and the prices of food were above the average of five "years."

3. *Registration of Births.*—Registration of both births and deaths was making progress and advancing towards greater accuracy. Further addition was made during the year to the population which furnish returns, and there remained only a small portion of the total of 30,835,771 in the province, among whom both births and deaths are not recorded. The figures on which all the calculations are based are those of the Census of 1881, and next report will no doubt discuss how far the records of the intervening 10 years accord with the Census of 1891—how far the results of this new census in the different districts and large towns tally with what the numbers would have been if all the births during the previous 10 years had been added to the Census of 1881, and all the deaths deducted from it. The increase in the birth-rate in Madras of late years may be, and probably is, due to the fact that the births among a larger population were still calculated on the census made some years previous. In 1890 the birth-rate equalled 31·3 per 1,000, the highest yet recorded. This is still considerably under the

rate in several of the other provinces. The rates for the five in which registration is most advanced stand thus for 1890 :—

Bombay	38·97
North-West Provinces	39·70
Punjab	39·08
Central Provinces	38·41
Hyderabad	42·5

The Madras average of 31·3 is composed of extremes varying from 18·2 in the Ganjam to 43·6 in the Madras district. In both the Ganjam and Nilgiris district exceptional causes were at work, but omitting these we still have great differences, which can hardly be explained on any other supposition than that the registration was defective. In the Vizagapatam district, for example, the rate was only 23, in the Kurnool district it was 41 ; but notwithstanding these and other contrasts just as marked there is evidence of improvement. The Government has again called attention to the necessity for greater care in the registration of births, especially in municipalities where, as has been found in other parts of India, the records instead of being better are often worse than they are in rural areas.

4. *Deaths.*—Owing chiefly to the diminished prevalence of cholera the mortality was less than in 1889,—22·8 compared with 23·5 per 1,000. The district ratios vary greatly, from 13, 16 and 17 in Ganjam, Nellore, and Malabar to 42 in Madras. This Madras ratio is far in excess of that in any other district. The next highest is 29 in Kurnool. The excess is attributed to the large number of deaths from *bowel complaints* and *all other causes.* The results in the different rural circles of each district are not shown, but in the municipalities, as shown in paragraph 21, the variations n the death-rate were just as marked as in the districts, the rates ranging from 17 in Berhampore to 54 in Palni. The great point to be ascertained is how far these marked differences were due to imperfect registration, and how far they represent actual facts, the explanation of which is to be found by careful examination of the locality and a remedy applied to the local disease. causes which may then be discovered. Marked contrasts in the death-rates at different places are not to be hastily put on one side as incredible and dependent entirely on defective registration, for the experience of both troops and prisoners in India shows how greatly sickness and mortality vary even in neighbouring places in the same year and even at the same time. And the presence of many children among the general population renders the community more subject to sickness than either troops or prisoners, among whom there are either no children at all or the number of children is comparatively small. The mortality among children under one year old in the Madras Presidency during 1890 is returned as 160·5 per 1,000. In the rates for males and females there is a decided difference, 173·3 among males and 147·7 among females, but a similar difference is to be found in all the provinces. In all of them the death-rate among male infants greatly exceeds that among female infants. Omitting Rajputana and Burma, in both of which registration is still very defective, the mortality among both male and female infants in 1890 was higher in all the other provinces, and in some of them much higher than in Madras In the North-West Provinces, where the maximum in both sexes is recorded, the death-rate among male children under one year during 1890 was 348, and among female children of the same age 316 per 1,000.

5. *History of the Chief Diseases. Cholera.*—Of the total mortality of 22·8 per 1,000 cholera contributed 1·2. The disease was more or less prevalent throughout the whole year, the maximum having been attained in January, and the minimum occurring in October. With three exceptions all the districts suffered, and in many of them numerous deaths were recorded in every month of the year. There is no attempt to trace the spread of the disease from any centres, and its general history is evidently not explicable on any such idea. We have the great fact that cholera, as is usual in the Madras Presidency, was very widely diffused over the whole province during the entire year, and we may therefore conclude that the cholera-producing causes were present in greater or less force during the year. We have also another great fact that while so widely diffused the centres of population which suffered were comparatively few. Of 238 circles of registration, 148 returned deaths from cholera and of a total of 44,449 villages in the whole Presidency only 4,197 returned deaths from this disease. If the inquiry be limited to those districts which suffered most, the number of villages which escaped was always much larger than the number which suffered. The disease was most severe in the south of the province. The greatest mortality, 3·4 per 1,000, occurred in Tinnevelly ; here, out of 1,616 villages, 581 returned deaths from cholera, a much larger proportion than usual. In 16 of the towns the cholera death-rate was high. In seven of these, nearly all of them in the south, the ratio amounted to 11 per 1,000 or upwards. In Palni, a town of the Madura district, it attained the high maximum of 28·8. Here and in two other towns where the mortality was very heavy, it is noted that " the water-supply is most defective."

6. *Comparison of Cholera in* 1889 *and* 1890.—Cholera was much less prevalent in 1890 than it had been in 1889. The deaths recorded in the one year fell short of those in the other by 40,732. There are some points in the history of the two years that are deserving of notice. The cholera of 1890, as we have already said, was most severe in the south. In 1889 it was most severe in the north, where in the districts of Ganjam, Godaveri, and Vizagapatam especially it caused a very serious loss of life. In Ganjam the death-rate from cholera alone equalled 14·2, in Godaveri 5·4, and in Vizagapatam 5 per 1,000. Much of this was associated with, if it was not directly due to, the semi-starved condition of the people consequent on the prolonged drought and to the other evils which followed on the want of rain, more especially the deficiency of the water-supply and the increase in

the impurities which it contained. In 1890 happily no district was subjected to this distressful state of things, and the highest district death-rate from cholera was 3·4; this was in Tinnevelly. In Madura the rate was 3·1, in Tanjore it was 2·6; but with these few exceptions the rate in no district amounted to more than 1·9, and in most of them it was much under this figure. The district rates for 1889 and 1890 are entered side by side in the following statement:—

—	Death-rate from Cholera per 1,000.		Circles of Registration.			Villages.			—
			Number in each District.	Number in which Cholera Deaths were reported.		Number in each District.	Number in which Cholera Deaths were reported.		
	1889.	1890.		1889.	1890.		1889.	1890.	
Anantapur -	1·9	0.03	8	6	2	906	68	6	
Bellary - -			11	11	—	1,597	142	—	
Chingleput -	1·5	0·4	7	7	6	2,000	231	105	No cholera in Bellery in 1890.
Coimbatore -	1·7	1·4	13	13	13	1,452	373	292	
Cuddapah - -	0·4	1·8	12	10	12	1,238	78	216	
Ganjam - -	14·2	0·04	8	8	4	7,174	1,151	24	
Godavari - -	5·4	—	14	14	—	2,202	454	—	
Kistna - -	2·4	·006	15	15	2	1,837	400	3	
Kurnool - -	0·4	·1	9	8	4	758	54	14	
Madras - -	0·4	1·7	1	1	1	1	1	1	
Madura - -	3·6	3·1	12	12	12	1,063	329	296	
Malabar - -	0·2	1·9	17	10	12	440	35	188	
Nellore - -	1·3	·03	12	9	6	1,874	96	13	
Nilgiris -	0·1	·08	5	3	3	48	5	3	
North Arcot -	2·0	1·2	14	14	14	3,638	289	435	
Salem - -	1·8	1·6	12	12	12	4,479	396	450	
South Arcot -	3·5	1·1	10	10	10	3,146	913	355	
South Canara -	0·3	—	6	6	—	1,276	78	—	
Tanjore - -	3·0	2·6	14	14	14	3,545	933	869	
Tinnevelly -	2·6	3·4	12	12	12	1,616	502	581	
Trichinopoly -	1·6	1·9	8	8	8	1,495	326	345	
Vizagapatam -	5·0	·002	18	18	1	2,667	830	1	

It will be observed that with the exception of five districts, Cuddapah, Madras, Malabar, Tinnevelly and Trichinopoly, the cholera death-rate of 1890 was under, and in most of them much under, that of 1889. The only inference to be drawn from the facts is that during 1890 the cause or causes which produce cholera were less powerful over nearly the whole Presidency of Madras than they had been in the year previous. It is of interest to note further that this diminution of power is evidenced not only by the diminished mortality as a whole in nearly every one of the districts, but also by the diminution in the number of centres of population which suffered. For example, in the district of Madura there is a slight reduction in the mortality, from 3·6 to 3·1, and there is a slight reduction in the number of villages attacked, from 329 to 296. In Kurnool a reduction in mortality from ·4 to ·1 is accompanied by a reduction in the villages returning cholera deaths from 54 to 14, and so on with other illustrations that might be given. On the other hand, an increase of mortality is attended with an increase in the number of villages from which cholera deaths were reported, as may be seen in the case of those few districts which suffered more in 1890 than they did in 1889. It may be thought that too much importance is being attached to the figures, and that where numerous centres of population in any district are attacked it is self-evident that the district mortality will in all probability be higher than where few centres are attacked, but the question still remains, why in one year are many centres of population attacked, not only over the Presidency as a whole, but also in almost every district of it, while in another the number is comparatively few? We would draw attention to only one other fact brought out in this statement, and that is that, even in those parts of the country which suffer little, the number of towns and villages attacked is far too large to admit of any attempt being made to check the disease by isolating the sick or cutting off communication with other places. However much they may be supported by theory, such attempts can prove only mischievous. The only practical means of dealing with cholera and other diseases is to improve the sanitary conditions under which people live.

7. *Small-pox.*—The mortality from small-pox in 1890 was 1· per 1,000, exactly the same ratio as in 1889. Of the 28,092 deaths, 6,286 were of children under one year, and 12,192 of children over one and under 12 years. With the exception of South Arcot, where the mortality equalled 4·5 per 1,000 the district mortality was in no instance much above the average. A few of the municipalities return a higher ratio, notably the municipality of Bezvada, where the deaths equalled 10·2 per 1,000. In only three of the others did the rate exceed 5. In the statement which contains the municipal death-rates from small-pox (paragraph 38) the "ratio per 1,000 of successful vaccination to population" is also shown in each, but it is not clear on what period this ratio has been calculated. However that may be, there does not seem to be any established connection between the two sets of ratios. For instance, Bezvada with 10·2 small-pox deaths per 1,000 returns 84·6 successful vaccinations per 1,000, and Cocanada with a death rate of 9·9, or only a fraction less than Bezvada, returns only 17·9 successful vaccinations per 1,000. Many other like discrepancies might be cited. If both calculations were taken over a series of years the results would probably be more uniform and show more clearly the benefits of successful vaccination.

8. *Vaccination.*—The vaccination work of the Sanitary Department forms the subject of a separate report. It is not necessary to do more than cite the main facts of the year, which, as a whole, are very satisfactory. Some increase was made in the staff of vaccinators, and there was a large increase in the number of vaccinations. The total for 1890–91, the year to which the report refers, amounted to 960,560, the maximum so far recorded. Of this total, 906,119 were cases of primary vaccination with a ratio of success of 94·1 per cent., and 54,441 were cases of re-vaccination, in which the percentage of success was 80·6, a very high and, it may be remarked, rather suspicious ratio for re-vaccination. A large part of the work of primary vaccination was among children, and it is stated that "24·1 per cent. of the infant population of the Presidency were successfully vaccinated during the year." In all but six districts the year's operations were in excess of those of the year previous. Vaccination was compulsory in 38 municipal towns, but complaint is made that the councils are for the most part very apathetic on the subject, and that the vaccinators do less work in the towns than they do in the country. Animal lymph was largely employed, but the question of substituting it altogether in the form of lanoline paste, in place of arm to arm vaccination was still undecided.

9. *Fevers.*—The year was marked by an excessive mortality under the head of fevers. The number of deaths attributed to this cause was 262,855, the maximum attained during 11 years. The next highest number during that period was 240,860 in 1887. The increase was very general, for nearly every district recorded a maximum mortality from fevers in 1890, and every month of the year, with the exceptions of August, October, and December, the fever deaths were in excess of what they had been in the same month of the previous year. The excess was most marked in the month of May, during which 35,038 deaths from fevers, or more than double the number of May 1889, were recorded, but from March to June there was great prevalence of fevers, as may be seen from the following comparison:—

	March.	April.	May.	June.
1889 - -	16,392	15,838	17,209	17,581
1890 - -	17,453	25,321	35,038	22,286

The Sanitary Commissioner remarks that "during April, May, and June many deaths were "registered, and this was due to the influenza epidemic which prevailed in the Presidency during "these months." In another place he speaks of the epidemic as having "prevailed from March to June," and this is more in accordance with the statistics above quoted, though it is at the same time to be observed that even in January and February of 1890 the fever deaths were much in excess of what they had been during the same months of 1889. The Sanitary Commissioner says that "by "some it was asserted that the malady had been imported by direct contagion from parcels, letters, "&c., emanating from infected districts, but this was not borne out of facts . . . . It did not "limit its attacks to particular districts or races of mankind, neither did it follow any regular line of "march, but spread with wonderful rapidity all over the Presidency. In some districts the disease "is reported to have been mild in character, while in others it was severe. During the prevalence "of influenza it has been found that the mortality is usually increased, often to a very remarkable "degree, the cause of influenza appearing to exert a power to modify any pre-existing disease with which "it may coincide, to impair extensively the vital energy so as to increase in the population of an "affected district the liability to contract other diseases, and also to lessen the ability to resist any "degree of fatal tendency which such concurrent diseases may possess." As in most of the other provinces the account of the influenza epidemic in Madras is very imperfect, and as it was the most remarkable feature in the sanitary history of the year it deserved very careful investigation and the collection of all the facts concerning it which could have been ascertained. So far as can be gathered from the few data recorded it would seem that the epidemic of influenza prevailed very generally all over India much about the same time.

10. *Bowel Complaints.*—The new heading "Dysentery and Diarrhœa" had not yet been adopted in Madras, and the old heading "Bowel complaints" was still in use. The total mortality from this cause equalled 0·9 for the province as a whole. During a series of years this general ratio has varied little, but there is considerable difference in the district rates for 1890, from 6·7 in Madras and 2·8 in Chingleput to only ·2 in Vizagapatam. In the 55 municipalities there was a maximum of 8·2 in Negapatam, and a minimum of ·2 at Bellary, the town of Adoni, with a population of 22,441, having returned no death under this head.

11. *Injuries.*—The deaths ascribed to injuries present no very marked variation from the experience of the previous year as respects the proportion ascribed to suicides, wounds and accidents, and wild animals. As a whole they were fewer by 1,104 than they had been in 1889. The general death-rate from injuries was ·4, this average being composed of district ratios varying from ·5 to ·1. In the comparison of the statistics of deaths ascribed to injuries in the Madras Presidency during 20 years the most noteworthy feature is the general reduction in the number of late years. The total (10,402) of 1890 is lower than ever before recorded, and if we compare the first half of the period with the second half there is a marked difference. In the first we find 14,000, 15,000, and even 16,000 in a year,

while in the second half the maximum is 13,000, and the other years are represented by 11,000 and 10,000 in each. Under the sub-head of suicides there is no such marked change, which is to be accounted for under the two other sub-heads of "wounds and accidents" and "snake bite and killed by wild beasts."

12. *General Results.*—"All other causes," that is to say, all causes not included under cholera, small-pox, fevers, bowel complaints, and injuries, embrace as usual a very large portion of the deaths. In 1890 they represent a death-rate of 10·1 throughout the Presidency, or little short of half the total mortality of the year. In some districts and towns they represent a very much larger portion of the whole mortality. This is unsatisfactory, but it is one of the inevitable defects of registration in a country like India, where the machinery available for the purpose is necessarily so imperfect. The main facts as regards the registration of both births and deaths in the Madras Presidency during 1890 may thus be summarised:—

Population, according to Census of 1881 - - - - 30,835,771
Births registered = 31·3 per 1,000.

Causes of Death.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	35,288	1·2
Small-pox	28,092	1·
Fevers	262,855	9·2
Bowel complaints	26,608	0·9
Injuries: suicide	1,991	—
„ wounds and accidents	6,369	—
„ snake-bite or killed by wild animals	2,042	—
Total injuries	10,402	0·4
All other causes	287,149	10·1
Total from all causes	650,394	22·8

13. *Sanitary Works.*—The only sanitary work of any magnitude executed during the year seems to have been the completion of the Bugga water project for the town of Cuddapah. On this Rs. 14,098 were spent during 1890. "The people," it is reported, "now use this water, which is very wholesome." A good deal of work was however "done in the way of sinking of wells, in repairing "and cleansing of tanks and wells, in the improvement of town and village sites, and in the con- "struction and repair of latrines, drains, roads, dust-bins, markets, slaughter-houses, &c." Of the total estimated income of the 55 municipalities, excluding Madras, Rs. 7,09,092, or 33·5, were sanctioned for sanitation, to be expended in the year 1890–91, and of this sum Rs. 4,20,513 had been spent up to the 31st December 1890, the year to which the Sanitary Report refers. It would be more satisfactory if in future years the expenditure during the full budget year could be recorded, both as regards municipalities and also district Local Fund Boards, of whose budget allotment of Rs. 5,41,254 for 1890–91 only Rs. 2,95,127 had been expended at the close of 1890.

14. *Sanitary Defects.*—Full tabular statements regarding the condition of the water-supply, drainage, and conservancy in the municipal towns in the local fund circles, and also in a number of villages, from which reports had been received, are given in the Report, and in them are many illustrations of existing defects. To these the Sanitary Commissioner is fully alive, and so is the Government. One great obstacle to their removal is the apathy of the inhabitants, who are most immediately concerned. This can only be overcome in full by the gradual education of the people in these matters, which so intimately affect their own health, and much good must result from the method employed by the Sanitary Commissioner. On this subject his remarks in paragraph 72 are of interest. "In almost all cases," he says, "I was as usual accompanied in my inspections of municipalities by "the chairman and some of the municipal councillors, with whom I discussed the sanitary defects "and needs of their towns, and took advantage of the opportunity to point out to them the more "glaring defects of the sanitary condition of their dwellings and surroundings. I also impresed upon "them the importance of the positions they respectively occupied as guides to their less favoured and "poorer countrymen in all matters connected with the general sanitary improvement of their towns, "and showed them how easily, by a little forethought, arrangement, and individual energy, they could "free their dwellings and streets from the filth and rubbish encumbering them, and thus not only "preserve their breathing air and drinking water from the multitude of sources of impurity and con- "tamination which now beset them, but also at the same time render their dwellings and their "surroundings far more comfortable, wholesome, and tidy than they were. At the same time the "importance of exercising a careful and strict supervision over the birth and death registration was "fully explained. The measures for the removal of sanitary defects are, however, being introduced "very slowly, and, although systematic reforms in the sanitation of towns are in a backward state, and "much, as yet to be done, still in many places a great deal of quiet improvement is being effected from "year to year in their general sanitary condition." Further on he remarks, "the extent to which the "observance of simple cleanliness in the arrangements of the private dwellings in towns is habitually "neglected is most astonishing, and is, above all others, the greatest difficulty we have to contend "with in efforts to improve the sanitary condition of our population centres. Not only is there over- "crowding and defective ventilation found everywhere, but no arrangements are made to provide for "the wholesomeness of the dwelling as a human habitation.

15. *Sanitary Engineer's Report.*—The Sanitary Engineer inspected 20 towns with special reference to the introduction of schemes of water-supply and drainage into some where such works did not exist, and the improvement of water-supply and drainage works already existing in others. Schemes for other towns were also reported on, and a *resumé* is given to show what progress has been made towards providing a water-supply and drainage for each of the 55 municipalities in the Presidency. The work, though only of a preliminary nature, was essential as the first step towards dealing in a practical way with these most important matters, and we learn from the orders of the Government that action has been taken in regard to several of the places concerned. In Ootacamund an extension of the water-supply had been sanctioned; proposals had been called for in order to provide some minor improvements which seemed to be required in the recently executed water scheme for the town of Cuddapah, in others the commencement of the work only awaited financial arrangements, while in those where apathy and want of interest were the cause of delay the attention of the municipal councils concerned has been drawn to the necessity of bestirring themselves in these very important reforms. Such apathy, we are glad to observe, is by no means general, for the Sanitary Engineer reports that "many towns have eagerly grasped the earliest opportunity of making some advance " towards the preparation of schemes for drainage or water-supply."

16. *Sanitary Board.*—The provincial Sanitary Board commenced operations on the 1st April 1890. It consists of the Sanitary Commissioner and Sanitary Engineer. There is no separate report of the Board's proceedings, but this omission will be supplied in future volumes, which will consist of three parts, the annual report of the Sanitary Commissioner, the annual report of the Sanitary Engineer, and the annual report of the Sanitary Board, the first two being signed by the individual officers and the last by both the members of the Board. The revised instructions for the guidance of the Board are given in an appendix. The Sanitary Commissioner is to deal "with all questions of general sanitation; the Sanitary Engineer with schemes for improving "the water-supply and drainage of " municipalities and the conservancy of rivers within their limits, and such other works of sanitary " engineering as he may be deputed to carry out or investigate." Copies of the Board's proceedings are to be forwarded to the local bodies concerned, and a monthly abstract submitted to the Government.

17. *Sewage Farms.*—In one of the appendices of this volume there is a very interesting report on the sewage farm system in the town of Madras. The idea was first started in 1869, and has been acted on with varying success ever since. During the year 1884–85 12 farms were under sewage irrigation, and the system has ever since continued in extensive operation. As a whole, the results have been satisfactory, and it is estimated that in the future they will be still more so, and that "the " municipality should during the next three years, from 1st April 1891 to 31st March 1894, realise a " profit on the sewage farms of Rs. 12,553, and dispose of considerably more than 4,500,000 gallons of " sewage a day." The experience of Madras in this matter is very valuable. There can be little doubt that farm irrigation is an admirable mode of disposing of sewage, and that it is specially suitable to the circumstances of India. Madras has had this advantage over many other places, that there have been no religious scruples or popular prejudices to contend with, such as exist elsewhere, but experience shows that opposition of this kind is likely to disappear when the substantial advantages to be gained are fully appreciated and understood. This Madras sewage report might, with advantage, be studied by the sanitary and other authorities in all the provinces of India. If the system could be generally adopted with success, it would prove the solution of an otherwise very difficult problem. Even if no profit were realised, it would be a very material gain to be able to dispose of the sewage of Indian towns in an innocuous way.

19th July 1892.

No. 11.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bombay for 1890.

1. *Proper Aim of Sanitary Reports.*—The greater part of this report is taken up with an examination of the vital statistics of the province during the year. Thirty-two pages out of the total of 62 are so occupied. Both births and deaths are compared with those of former years, and the results for 1890 are given in detail for each registration circle, so that the units of which the district averages are composed may be seen at a glance. It is very desirable that such an examination should be made in all the Sanitary Reports, so that the birth-rates and the death-rates may be localised as far as possible. The next step is to inquire what are the causes of low birth-rates and high death-rates, why these rates vary so much in different places, often in different parts of the same or neighbouring districts, and then there should come the practical object for which the registration of births and deaths was instituted, and to which all Sanitary Reports ought to be directed—the removal or remedying of these causes so far as this can possibly be accomplished. It is essential that this great object should be kept constantly and prominently in view, because it is very apt to be lost sight of. The registration of births and deaths, however accurate, and the writing of reports, however full of interest they may be, are but means towards the great end of sanitary improvement.

2. *General Results.*—During 1890 the health of the people of the Bombay Presidency was, as a whole, satisfactory and showed considerable improvement on the year previous. Under all the great heads, cholera, small-pox, &c., there was a diminution in the number of deaths more or less marked, and there was at the same time a considerable increase in the number of births. The excess of births registered during 1890 as compared with 1889 was 40,626, while the deaths registered were 54,946 less numerous, so that between the two the population during 1890 rose by nearly 100,000 lives as compared with the previous year. The question at once arises, how are these remarkable differences in the two years to be explained? They were not confined to a limited part of the country. All the 24 collectorates except four returned higher birth-rates, and all of them except seven returned lower death-rates. Some great general causes must have been at work to produce such general results, and it should be the aim of every Sanitary Report to discover as far as possible what these causes are, a very difficult problem no doubt, and one which may defy all attempts at complete solution, but the very difficulty of its nature renders it all the more necessary that it should be examined with the greatest care, and that the facts should be carefully placed on record, in the hope that as the evidence accumulates they may form the basis for sound conclusions. There are two general causes always at work which must have an immense influence on the health of the people, and which do not, as a rule, receive the attention they deserve in Sanitary Reports—the atmospheric phenomena and the supply of food. Of the food supply during 1890 we can find no mention in the report, and the meteorology of the year is confined to observations made at a few places when cholera was present. It is very desirable that these omissions should be supplied in future reports, because there can be no question that both these sets of facts are, and must be always, most intimately associated with the health history of the year. A discourse on meteorology is not wanted, but an attempt should be made to show how far the chief atmospheric phenomena in each district varied, not from the average, but from the actuals of former individual years, and how far food was dearer or cheaper, as the case may be. If these great facts are taken district by district in conjunction with the figures of births and deaths, some general laws may in time be arrived at. The records of any one year are insufficient for such a purpose, and the object ought to be rather to collect carefully sifted facts than to draw conclusions.

3. *Births.*—During the last 11 years the recorded birth-rate in the Bombay Presidency has risen greatly. In 1881 it was only 27·93, in 1889 it was 36·49, and in 1890 it attained the maximum of 38·97. This cannot be explained by any increase of population occurring between 1881 and 1891, unless such increase were due to immigration, which is not probable. The increase, as we have already seen, was general. The four districts which show a lower birth-rate for 1890 vary but little from the ratio accorded in 1889, whereas in many there is a marked increase, in some few as much as 5 or 6 per 1,000. Taking the province as a whole, the male births were to the female births in the proportion of 108·55 to 100, but this average excess is mainly due to certain districts in Sind, where the registration was very inaccurate, and where, as so often happens, this inaccuracy is represented amongst other ways by an excessive proportion of male births. In Hyderabad the proportion was 136 per cent. It is deserving of notice that the provincial birth-rate, 38·97, was most unequally distributed between town and country, for while the town rate was only 28·40, the country rate was 40·52. The result in 1889 in this respect was much the same, and indicates either that there is a preponderance of males in the towns, or that the births in towns are very imperfectly recorded. The diagram which the Sanitary Commissioner has furnished opposite to page 5 displays in a very graphic way the extremes of birth-rates in the talukas of each district. By means of concentric rings these rates are arranged from the minima at the centre in gradually increasing ratios till we reach the maxima at the circumference—from those below 20 to those above 50 per 1,000. The highest recorded rate was 39·67 in Karmala, a rural circle of the district of Sholapur.

4. *Deaths.*—The total mortality during 1890 equalled 28·18, in 1889 it equalled 31·51, and, as we have already remarked, this result was not confined to one particular part of the province, but was very general. Among males the ratio was 28·58, and among females 27·75, or 109 male deaths to every 100 female deaths. Here again the provincial average is much disturbed by the imperfection of the Sind registration, where the male deaths are largely in excess. In the Upper Sind frontier they exceeded the female deaths in the proportion of 132 to 100. In the city of Bombay, and Broach, and Ahmedabad, the recorded birth-rate was less than the recorded death-rate. In Kanara the two rates were almost the same. In all the other collectorates the births exceeded the deaths, and in some of them this excess was great, in a few as much as 22 per 1,000. In Bombay the deficiency of over 6 per 1,000 is ascribed partly to defective registration of births, but experience has shown, as was to be expected, that the result may be fully accounted for by the abnormal preponderance of males in the population, and some information on this point, which is not provided for in the standard tables, would have been of interest. A similar diagram to that employed to illustrate the varying birth-ratios is employed to illustrate the varying death ratios. Starting from a minimum of the Kohistan ratio of 8·87 per 1,000 at the centre, we gradually arrive near the circumference at the maximum of 46·65 registered by the town of Dholka, in the district of Ahmedabad. We may observe, however, that in the tabular statement detailing the records of the registration circles in this district we find the death-rate entered as 47·70. There are other entries which we are unable to reconcile with those in the diagram, as, for example, those concerning Viramgam, the death-rate of which appears as 39·63 on the diagram and 80·88 in the tabular statement.

5. *Steps to improve Registration.*—The calculations for 1890 have all been made on the census figures of 1881. With the report for 1891 the figures of the census of that year will come into play, and an opportunity will be offered of testing the registration of births and deaths during the intermediate 10 years by comparing the results with the totals of the two censuses. It does not appear

what steps are taken to verify the registration records by the officers of the Sanitary Department during their tours. It would be interesting to know how many places are annually inspected by these officers with the express object among other things of seeing how far the registers agree with the information otherwise obtainable on the spot, what tests are applied, and with what results. Much good might be done in this and other sanitary matters, not only by the officers of the Health Department, but by the officers of every Department on their tours. In the orders of the Government of Bombay, attention is drawn to those places where the registration is evidently defective, and "it is "hoped that when circle inspectors are appointed throughout the Presidency, and systematic tests "taken by them, the results will improve considerably." This is the only mention we have seen made of any scheme of circle inspectors, and we are inclined to believe that much might be done with already existing establishments as we have above suggested, and especially by utilising the vaccination staff in this important object.

6. *History of the Chief Diseases. Cholera.*—The history of cholera during the year is very briefly told. Compared with other years the disease was but little prevalent, and caused but a small part of the total mortality. The deaths numbered only 3,259, or ·20 per 1,000. During the previous 19 years the number had fluctuated between a minimum of 37 in 1874 and a maximum of 57,252 in 1877. Compared with 1889 the results in 1890 were very favourable, for in that year the recorded deaths from cholera numbered 32,431, or 1·97 per 1,000. Roughly speaking, the cholera of 1889 was thus just 10 times as severe as the cholera of 1890. In 1889 every district returned deaths from cholera. In 1890 six out of the 24 returned none. In 1889 in 14 districts the cholera death-rate exceeded 1 per 1,000; in 1890 no district suffered to that extent. In 1890 the highest death-rates from cholera were ·77 in Karachi, ·94 in Belgaum, and ·99 in Satara. In 1889 there was a maximum of 5·78 in Bijapur, and in several other districts the ratio fell not far short of this. The contrast is most instructive, and it is equally marked if we take the statistics of villages. Out of a total of 24,535 villages in the Bombay Presidency, 2,831 returned deaths from cholera in 1889; in 1890 this number was only 377, and we have similar results if we take the districts separately, for in every one of them without exception the number of villages returning deaths from cholera during 1890 was less than it had been in 1889; in many of them it was but a tithe of what it had been in that year. A few illustrations of this will suffice:—

District.	Villages.		
	Total Number in District.	Number returning Cholera Deaths.	
		1889.	1890.
Khandeish	2,679	262	10
Nasik	1,629	280	3
Thana	1,880	116	19
Ahmednagger	1,331	192	9
Poona	1,181	176	8
Sholapur	709	232	29
Bijapur	1,139	361	5
Ratnagiri	1,295	13	10
Kolaba	1,191	10	9
Karachi	722	104	101

The only districts in which the numbers in the two years approximate are the three last in the above statement, and in regard to them it is to be observed that in neither year did they suffer severely, and that the mortality in them due to cholera differed little in the two years. We gather thus that the intensity of the cholera during 1889 as compared with 1890 was indicated by the much higher death-rate it caused, by the larger number of districts that suffered, by the larger number that suffered severely, and by the much larger proportion of villages attacked in every district. In both years the disease was more or less prevalent in some part of the Presidency in every month of the year, in 1889 it was almost always present in most districts, in 1890 this constant presence was less marked in individual districts taken separately. The conditions of life, so far as we are told, were the same in both years, the same free and unrestricted communication on all sides, and yet in 1890 the cholera mortality was but one-tenth of what it was in 1889. We can only infer that the cholera producing causes, whatever these may be, were 10 times more powerful in the one year than they were in the other. How far these causes were favoured by local conditions is the great matter for inquiry. In only three of the 56 towns in the Presidency during 1890 did the cholera death-rate exceed 1 per 1,000. The highest, 9·65 per 1,000, was reached at Athni, a town of the Belgaum district (in Standard Form No. VI. the ratio is given as 0·65). There is no account of the sanitary condition of Athni, except the remarks opposite it in Appendix IV., in which it is said that the water supply is "from tanks and wells," that in respect of drainage "there are no water-logged or low-lying sites," and that "the night-soil is "removed to a spot outside, about 1½ miles distance from the town, and buried."

7 *Small-pox.*—Like cholera, small-pox was much less prevalent in 1890 than it had been in the previous year, but in respect of the disease the difference was less marked. In 1889 the deaths from this cause numbered 7,066, and in 1890, 2,877. The average mortality in 1890 equalled ·17 per 1,000 varying from ·63 in the district of Broach to ·01 in Ahmednaggar and Ahmedabad. The statement

given by the Sanitary Commissioner to show the annual deaths from small-pox since 1879 seems to show that the disease has diminished, for during the first six years of this period the small-pox deaths totalled 32,107, while in the last six years they totalled only 20,835. At the same time it is to be noted that the three first years of the first period show fewer small-pox deaths than any three of the others, and that 1881, the third in the series, shows the minimum of 539 deaths. It would be interesting to have the ratio of successful vaccinations per 1,000 of population in each of these years side by side with the small-pox mortalities, but to be complete, and show clearly the effect of vaccination on small-pox, the figures should be given by districts, and not only for the Presidency as a whole.

8. *Vaccination.*—The work of vaccination has been carried on in the Bombay Presidency for many years with great energy and care. In none of the provinces is there so large a staff of superior officers engaged in this duty. In 1890–91, the year to which the last report refers, there were, in addition to the Sanitary Commissioner, five Deputy Sanitary Commissioners, three Superintendents of Vaccination, 36 Inspectors of Sanitation and Vaccination, and six Assistant Superintendents of Vaccination. Owing to various causes, and, among others, to the prevalence of influenza at a most important time of the year, the number of operations performed fell somewhat short of the number in 1889–90, but a goodly amount of work was done. From 1881–82 onwards the number of persons primarily vaccinated increased from 729,323 to 900,237, the maximum attained in 1889–90. The results of 1890–91 fell short, not only of those of the year immediately preceding it, but also of those of the two years before that. The total primary vaccinations in 1890–91 were 885,260, and of re-vaccinations 46,487, the percentage of success being respectively 95·10 and 61·22. In the orders of the Government attention is called to the want of more detailed information as to the work done by the inspecting officers. We would suggest on this point that, instead of showing the number of villages visited for this purpose, it would be more satisfactory if the actual number of cases seen by the inspecting officers were shown, and also the percentage of success actually verified by them.

9. *Fevers.*—The mortality registered under this general head of fevers was 20·96 per 1,000, or only a fraction less than that of 1889, when it stood at 21·08. The district rates varied from 8·37 in Bombay to 34·91 in Ahmedabad. If the town mortality be taken separately, there are even more striking extremes, from 4·26 in one to 69·30 in another. The last very high ratio was recorded at the town of Viramgam in the Ahmedabad district. In Appendix IV. the remarks regarding this town give some clue to the fever mortality; it is stated there that "a channel has lately been cut " to carry away water collected in low lying grounds around the town. Pits have been filled up." One remarkable feature in the fever mortality of 1890 was its unusual extent in the early months of the year. In April there were 42,786 deaths recorded under this head compared with 30,482 in April 1889. The Sanitary Commissioner observes that "a certain proportion of the mortality in April may be attributed to influenza," and this, with a similar remark in another paragraph, seems to be the only mention made of this great epidemic in the whole Report. That it was severe and widespread we may infer from the fact that the vaccination work was seriously impeded, because so many of the staff were prostrated by it. It is very much to be regretted that in the Bombay Presidency, as in most other parts of India, the opportunity was neglected of obtaining much valuable information regarding this most obscure disease. Facts carefully collected from all the provinces of India could hardly have failed to throw some light on it; and, even if they had failed to establish any certain or complete explanation of its cause, the facts themselves would have been well worthy of record for the benefit of present and future observers. Whenever any unusual sickness prevails, or threatens to prevail, the Sanitary Commissioner should, we suggest, take the earliest steps for obtaining information regarding it. Much could not be learned from the registers of deaths, but the Civil Surgeons and their subordinates and the vaccination staff also might have contributed most valuable data regarding the general population, to which might have been added the experience of the jails and troops in different parts of the country.

10. *Dysentery and Diarrhœa.*—The other great heads under which deaths are registered do not call for many remarks. Under dysentery and diarrhœa the deaths fell from 48,202 in 1889 to 36,037; a comparison of the different districts shows that the provincial ratio of 2·19 per 1,000 is made up of very varying district ratios. In Sind there was a minimum of ·16, the average of the five districts into which Sind is divided. On the other hand, we may have the maximum of 6·99 in the district of Belgaum. In the towns we find still more marked extremes. In one or two no deaths were registered under this head; in two towns of the Belgaum district, Gokak and Athni, which returned the high cholera death-rate already referred to, the ratios were over 11 and 10 per 1,000, and in Gadag Bettigiri, a town of the Dharwar district, the maximum of 14·70 is recorded. In regard to this ast we note that "the reclamation of low lying and water-logged sites is under consideration."

11. *Injuries.*—Under the head of injuries some interesting facts are mentioned. Excluding 1879, when, for some unexplained reason, the total of these fatal cases exceeded 7,000, their annual number has varied little, and stands at between 5,558 and 6,082. On other points, also, there is a remarkable similarity between different years. Taking 1889 and 1890, regarding which more complete particulars are furnished, the deaths due to the various forms of injuries,—drowning, poisoning, hanging, wounding, wild beasts, snake bites, and other causes, in these two years show little difference. Under poisoning they are exactly the same. The mortality due to injuries as a whole varies less district by district than it does under any other head, the range being between ·19 and ·57 per 1,000. The deaths due to snakes amounted to 1,218. This is somewhat in excess of the number recorded during each of the previous five years; of the total of 1,218 persons whose death was attributed to

this cause 833 were males, and only 380 females. A similar preponderance of male deaths is to be found under the heads of hanging, wounding, and other causes, but under drowning, both suicidal and accidental, the female deaths were much the more numerous. The statistics of injuries are not only of interest in themselves but also as affording internal evidence of general accuracy in the record.

12. *Sanitary Board.*—In the section of the Report devoted to personal proceedings and general remarks, the Sanitary Commissioner has given a brief *resumé* of his inspection of 24 towns or other places which he visited during the year. He has noted what improvements had been effected since his last visit, and has pointed out what further steps he would recommend. The district officers have been called on by the Government "to report what steps, if any, are taken or proposed for "dealing with the evils pointed out." It is said that "the majority of the municipalities, however "willing they may be to improve the sanitation of the areas under their control, labour under the "disadvantages of very limited pecuniary resources, and of having no skilled sanitary engineer to "whom to apply for advice." No mention is made in the Report of a Sanitary Board, but we are glad to learn from the despatch of the Government of India, Sanitary, No. 1, dated 13th January 1892, that such a Board has been sanctioned, consisting of the Sanitary Commissioner and a Sanitary Engineer, and that the selection and appointment of the Sanitary Engineer was shortly expected. The formation of local Sanitary Boards and committees in villages and groups of villages had been provided for by the Bombay Village Sanitation Act of 1889. A copy of this Act would have formed an interesting and valuable appendix to the Report, especially if some information had at the same time been given as to the extent to which it had so far been applied.

13. *Health of the Port.*—The Annual Report of the Health Officer of the port is summarised in a series of tables which are given in this same Section X. We doubt much whether the measures of quarantine and the like which seem to be taken with incoming vessels can be productive of any benefit, while, on the other hand, they no doubt prove most irksome to those concerned, and must cost money which might be much better expended. But, what is most important of all, they must greatly embarrass our relations with other Governments who have so persistently advocated quarantine in opposition to English authorities. We observe that six vessels, with 4,823 people on board, were quarantined on account of eight cases of small-pox, but the statistics of Bombay show cases of this disease in every month of 1890. Several hundreds of cases altogether there must have been, for 151 proved fatal, and these could not have been isolated and quarantined. Nor could the entrance to Bombay on the land side have been guarded, or the arrival of cases of small-pox from that direction prevented. In addition to ordinary sanitary measures of improvement, the great preservative against small-pox is vaccination, and it must tend greatly to shake faith in vaccination, especially on the part of natives of India, when they see that the authorities by their action display so little faith in it themselves. Then, again, we observe that vessels from Jeddah, suspected of carrying cholera, were dreaded as a source of importing the disease into Bombay. Cholera caused deaths in Bombay during 1890 in 11 months out of the 12. We know of no instance in which a vessel coming to Bombay can be connected with an outbreak of cholera in that city, nor have we ever heard of any epidemic of cholera moving in the direction from Jeddah to Bombay. We have made these remarks because they have, we believe, a most important bearing on the practical work of the Health Officer of the port. His proper duties—the direction in which he can really be useful—is not to deal so much with vessels entering the port as with those going out of it, and also with the sanitary condition of the port itself. The Sanitary Commissioner's remarks regarding the state of the foreshore of the Sasoon Dock and other parts of the harbour show that much is still required in this last direction.

14. *Sanitary Improvements.*—Although some major works were under consideration, no improvements of any magnitude were commenced or finished during 1890. In regard to the troops, a statement appears in Appendix III., showing how sums, varying from Rs. 16,380 at Poona to Re. 221 at Hyderabad, were expended on drains, latrines, &c. The wants of towns and villages, and the steps taken to meet them, are detailed, though not so fully as we should like to see them, in Appendix I., which is a "Sanitary Estimate of Villages and Towns in the Bombay Presidency "inspected by the Deputy Sanitary Commissioners in 1890," with the addition of extracts of Civil Surgeons' reports, and then there is Appendix IV., which is headed "Sanitary Civil Works (Municipal)." The work done by the Deputy Sanitary Commissioners seems to have been very unequal, as may be seen by the following figures, totalled for each circle. The Deputy Sanitary Commissioner

For Western District	inspected	7	towns	and	62	villages.	
„ Central	„	„	21	„	„	102	„
„ Southern	„	„	4	„	„	2	„
„ Eastern	„	„	6	„	„	22	„
„ Sind	„	„	15	„	„	10	„

In all of them the amount of the inspection done was very small, and in some so small as to make us doubt whether we have correctly interpreted the figures given in the Report. Similar remarks apply to the work done by the Civil Surgeons, as indicated in the statement which covers pages 12 and 13 of the Appendix. In some districts this officer inspected and reported on some 10 towns and as many villages, while in other districts he inspected only one or two of each. We are well aware that circumstances vary much, and that the work of Civil Surgeons in this matter cannot be judged by one rule, more especially as their duties at headquarters often leave them little time for

inspections, but it is most important that their valuable aid should be given in endeavouring to improve the sanitary condition of towns and villages in their neighbourhood, and there are generally many places within easy reach where their advice would be a benefit.

19th July 1892.

No. 12.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Hyderabad Assigned Districts for 1890.

Year comparatively healthy.—In the Hyderabad Assigned Districts, or Berar as this province is often called, the public health showed a marked improvement as compared with the year previous. *Cholera* and *small-pox* were both much less prevalent, and there was indeed a diminution of the mortality under every head except *fevers*. Under them there was a fractional increase. So far as the information given goes it is not possible to associate these results with any change in the general conditions. There seems to have been nothing remarkable in the meteorology either as regards temperature or rainfall. The fall was not excessive and it does not appear to have been unusually distributed. On this point, however, as we have explained more fully in dealing with some of the other sanitary reports, more complete details distinguishing individual places are desirable. The food supply of the people during the year is another important element to be carefully considered in connection with the statistics of both births and deaths. What were the monthly prices of the chief grains in the different districts during the year, and how far did these differ from the prices of other years? This is a question which the Sanitary Commissioner has not answered. No special place has been assigned to it in the general plan of Sanitary Reports, but it ought not to be lost sight of.

2. *Births.*—The section of this Report which is devoted to vital statistics has been carefully prepared, and contains much interesting information. The province is small, and the population, according to the Census of 1881, amounted to only 2,620,573, a mere handful compared with that of some of the other provinces we have to consider, such for example, as over 18 millions in the Punjab, 44 millions in the North-West Provinces, and 65 millions in Bengal. It is therefore much more easy to exercise supervision over the returns than in many other parts of India. At the same time there can be no doubt that during his long tenure of office as Sanitary Commissioner, Dr. Little has devoted much attention to the registration, and the results, though by no means perfect, are very gratifying. The births recorded during the year yield a ratio of 42 per 1,000, or an increase of three over the ratio of the year previous. Only two other years, 1882 and 1885, show so high a birth-rate since registration was first established in 1868. In the earliest years the rate was very small, only 18 and 16 per 1,000 By 1873 it had risen to 28, in 1874 it leaped to 36, and since then it has only once been below that figure. The small ratios of the earlier years are naturally to be ascribed to the imperfection of the system on its first introduction. There is a difference of about 7 per 1,000 in the district birth-rates during 1890, or between 40 and 46·9. It would greatly help to form a more exact idea as to the correctness of the registration if we had the extremes of the places in each district —the rural circles and towns which are the units adopted for the purpose. It is to be noted that, as not unfrequently happens in other parts of India, the birth-rate in the towns is considerably less than that of the rural population, 38 as compared with 43 in 1890. The Sanitary Commissioner explains this, on the ground that "the difficulty of ascertaining births is manifestly greater in towns "than in villages where the smallest event cannot happen without the cognizance of the village "officials." The differences presented by the towns fully bears out this remark, as we find that the rate varies between 57 in Badnera and only 18 in Amraoti, and a comparison of 33 towns during the two years 1889 and 1890 shows that they maintain to a great extent their relative position in respect of birth-rates. In both years Badnera heads the list, and Amraoti is at the bottom of it. The new census figures may throw some light on these discrepancies. The Commissioner remarks that this census has brought out a marked increase in the population of Amraoti city, and that therefore the low birth-rate is even lower, and more inaccurate, than it is made to appear. There may, however, be disturbing elements in the proportion of the sexes here and in other towns of Berar such as are to be found in marked degree in Calcutta and Bombay, and which keep the birth-rate at a very low figure. Into other obvious ways of employing the new census figures as a means of checking the registration of past years, and of providing a basis for more exact results in future, we would refer to our memoranda on some of the other Sanitary Reports for 1890. The Sanitary Commissioner gives some interesting information regarding still births, which are not usually provided for in the statistics. The number of these in 1890 was 4,484, compared with 4,386 in 1889. The district returns relating to them show a remarkable similarity, and the provincial ratio based on them stands at 2·3 for males and 1·7 for females. The proportion of still births to total live births in Berar was 4 per cent. The proportion of boys born alive during 1890 was 106 to every 100 females; the proportion of males who died to every 100 females who died was 111. In regard to births we have only further to observe that the birth-rate of 42 in Berar is the highest registered in any of the provinces during 1890. In the Punjab it was 39·08, and in the North-West 39·70. In Bombay and the Central Provinces, both of which join Berar, the rate was 38, or 4 per 1,000 short of that in Berar. Accurate statistics regarding births are not only valuable in themselves but also in their bearing on the deaths, as it is among infants that the highest mortality occurs. In Berar, for example, during 1890, out of a total of 93,020 deaths nearly 24,000 were registered as having occurred in children under one year.

3. *Deaths.*—The mortality of 35·4 per 1,000, the ratio which the statistics of 1890 yield, is very favourable compared with that of 1889, when it equalled 42·5, or almost 7 per 1,000 more than in the year under report, but in 1888, on the other hand, it was 24·7. The extraordinary fluctuation in the annual death-rate, as the Sanitary Commissioner remarks, and as we have frequently noticed, is one of the most striking characteristics of Indian mortuary statistics, and shows how fallacious it is to attempt to fix any standard for comparison by taking the average of a series of years. For example, in Berar, the average annual mortality of the five years before 1890 is 36 per 1,000, but this is the mean of figures which include such extremes as 24 in one year and 45 in another. If we carry the examination further back, we find that in 1878 the death-rate equalled 81, in the succeeding two years it was only 23. In 1890 the range was between 29 in the Wun district and 40 in Buldana. If we examine the relative mortality in these two districts under different heads, as shown in Tabie VI., we find that the results are not to be accounted for by any epidemic. It is only under *fevers, dysentery and diarrhœa,* and *all other causes* that the ratios vary much. Under fevers Wun shows a death-rate of 22 compared with 16. Under *dysentery and diarrhœa* Buldana returns 4·7 compared with 1·8 in Wun; but the most marked difference is to be found in the column including "all other causes," for here, while Wun registered 4·7, Buldana registered 18·7, a result which is not explained, but which calls for some explanation. The town mortality is recorded as 32 compared with 35 in the country. It is remarkable that with the single exception of Wun all the districts return a higher death-rate in the rural circles than in the towns. The results in the towns taken individually indicate defective registration, for the ratio varies between 21 and 48. Attention has been drawn to particular places where the defects are most apparent, so that steps may be taken to remedy them. The mortality among children was as usual distressingly high, 256 among female infants under one year, and 308 among males, or if the two sexes be taken together, the ratio equalled 256 per 1,000. These results are arrived at by calculating the deaths on the numbers living according to the Census of 1881. If the computation be made of the births of the year the mortality is reduced to 213, being 223 for males and 204 for females. The districts returns under this head show suspicious variations. Among infants under one year the rate for Wun was 248 and for Buldana 312. Among children of one year and under five the extremes are even greater, for in Wun, again, there is the minimum of 53, and in Buldana the maximum of 104, or nearly double.

4. *History of Chief Diseases. Cholera.*—Much interesting information is given respecting the history of cholera in Berar during 1890, and the experience of the province as regards this disease in former years. A special table exhibits the number of deaths recorded under this and other heads during each of the 23 years since registration was established, and the contrasts presented in the cholera statistics are very striking and instructive. In one of these years (1873) not a single death from cholera was recorded. In 1874 only two such deaths were recorded. In 1875 the number was 22,465, and in 1878 there was the maximum of 34,306. In 1890 Berar suffered comparatively little. The disease was widely spread, it was present more or less during the five months from August to December, but the total deaths amounted to only 847. It is impossible in the present state of our knowledge to explain these extraordinary differences, why in some rare years cholera should be almost or altogether absent over so large an area and why its prevalence in others should be slight or intensely severe. The Sanitary Commissioner observes that "intensity of cholera "prevalence is generally attributed to (*a*) insanitation, (*b*) predisposition, and (*c*) climatic causes. "Local insanitary conditions are present more or less in every native village, but these conditions are "equally prevalent whether in years of maximum or minimum intensity." Although this may be and probably is quite true, the local conditions are none the less important and they are moreover the only disease causes with which the Health Officer can deal. Atmospheric conditions, however intimate their relation with epidemics may be, are beyond control; predisposition is a matter for the individual rather than the State, but local insanitary conditions are a constant source of danger which the Health Department can do much to remove. In the history of cholera outbreaks these conditions frequently do not receive the attention they deserve, and we should have liked to have had more particulars regarding them in this Report. Out of the six districts into which Berar is divided, one entirely escaped—Ellichpur. Here, out of a population of 261,705, not a single death was registered as due to cholera. In Akola and Bassim the deaths were very few. In the other three districts Amraoti, Wun, and Buldana, the mortality was the same, ·5 per 1,000. [In Statement No. VII., which is devoted to cholera, the figures for the Wun and Bassim districts have been transposed.] The distribution of the disease by villages is even more striking than it is by districts, for though five out of the six districts reported deaths, these deaths were limited to 84 out of a total of more than 5,000 villages in those districts. Neither the Sanitary Commissioner, nor the Civil Surgeons favour the idea that the disease was to be accounted for by importation. The first two known cases in the province occurred almost simultaneously, one on the 31st July, and the other on 1st August, at two extreme points about 150 miles apart. In none of the places concerned is there any history favouring the importation theory. The Civil Surgeon of Amraoti seems to come to this conclusion very reluctantly. He writes regarding the outbreak in the Buroor circle of his district, "There is nothing "to connect the first case, which I think was one of undoubted cholera, with the case which occurred "13 days later. I cannot, however, avoid myself thinking that there was some connection and that a "choleraic condition was in some way induced in the village by the death of Tukaram on the 31st. "How induced I cannot attempt to guess, nor is there the slightest proof that the death of Tukaram "from cholera on the 31st July caused an outbreak of the disease 13 days later." Tukaram had been to Pachmari and was taken ill on his way back. We have quoted the above passage because it well illustrates how little is to be gained by travelling away from the facts. Regarding sanitary conditions, as we have already said, more information is desirable. The following extracts concerning places where disease prevailed may be noted, "The sanitary state of the village (Meljanoree in the

" Buldana district) is very bad indeed. Rubbish heaps are to be seen in several places within the " village precincts. It is surrounded with overgrown rank vegetation . . . . . 6 feet in height " . . . . . cattle were housed in all the affected dwellings . . . . all the sheds were notably " saturated with urine, and a strong smell of ammonia pervades the air of many." Regarding the outbreak in the first village attacked in the Buroor circle of the Amraoti district, the Sanitary Commissioner remarks, "The Civil Surgeon's Report makes no comment on the sanitary " condition of the village, but subsequent inquiry showed that it was very dirty." In the Wun district the Civil Surgeon describes the village of Larkhed, where the disease lasted 42 days, as " in a fairly good sanitary condition, but damp. There was no evidence of importation, or of the " water-supply being infected." In one of the houses in which a case had occurred, he found that the grain which was being ground into flour smelt so offensively that it contaminated the air of the whole house. In one of the Akola villages attacked, the disease is attributed to surfeits during certain ceremonies, and to " the insanitary condition of the village," but no particulars are given.

5. *Small-pox.*—The year 1890 in Berar was a time of comparative exemption from small-pox. The deaths from this desease numbered only 324, or the equivalent of ·1 per 1,000. The highest ratio in any district was ·3 in Buldana, and this was in the main due to an outbreak in the town of Nandura, in which 25 deaths occurred. The only other outbreak seems to have occurred in Amraoti, where the deaths numbered 30, the total for the rest of this district having been only 16. These results afford a favourable contrast with those in many other years. In 1889, for example, the deaths from *small-pox* numbered 1,737, and if we go back to earlier times we find that this total was largely exceeded. In 1872 and again in 1873 it amounted to more than 8,000. The question naturally arises how far is the decrease during 1890 to be ascribed to vaccination, and how far to those unknown laws which govern epidemic prevalence? The earlier years, as we have just seen, present examples of severe epidemics, but they also afford examples of remarkable exemption. In 1879 the small-pox deaths numbered only 71, and in the year following only 39. The question we have put can only be answered satisfactorily by taking the experience of a series of years, both as regards small-pox and vaccination, and the Sanitary Commissioner has supplied some valuable data in regard to both, beginning with 1868, when registration of deaths was first introduced. He divides the period into sections, containing five years in each, and the mean results he arrives at are as follows :—

—	Successful Vaccinations per 1,000.	Deaths from Small-pox per 1,000.
1868–72	8·92	2·02
1873–77	25·72	1·56
1878–82	31·2	·58
1883–87	34·6	·38
1888–89	36·6	·30
1889–90	35·4	·70
1890–91	36·8	·10

This statement, so far as it goes, is very satisfactory. During the four five-year periods the successful vaccinations per 1,000 of population rose steadily from 8·92 to 34·6, and in the three following years which form part of the current five-year period, there was a further advance to 36·8. On the other hand, the small-pox deaths which averaged 2·02 per 1,000 in the first five years fell to ·10 in 1890. We would only suggest, as we have already done in noting on other reports, that the information tabulated for the province as a whole should be given in detail by districts. It is only by comparing the two sets of facts, as far as possible locally, that the work of the vaccinators can be thoroughly checked. We observe that in 1890, 88 per cent. of the total deaths from small-pox were registered among children.

6. *Fevers.*—The deaths from fevers were almost the same as they had been in 1890, 47,894 compared with 47,104. The fever death-rate, 18 per 1,000, was thus high, and is in fact only exceeded by that of two years since registration commenced—1880 when it was 20, and 1878 when it reached the exceptional ratio of 38. Taken by districts the mortality varied between 12 in Bassim and 22 in Wun. If we turn to the record of individual towns, as exhibited in Table VI., we find much more marked differences, between 4 at Karasgaom and 30 in several other towns. The high fever rate in the Wun district is attributed to the fact of " there being much more uncultivated " jungle and forest land in this than in any of the other districts." Why Bassim should persistently retain the lowest rate of fever mortality, the Sanitary Commissioner remarks, is not clear, but the same result is borne out by the dispensary statistics.

7. *Dysentery and Diarrhœa, &c.*—Regarding the other headings under which the deaths were registered, we have very few remarks to offer. As usual Berar records a very high mortality as due to *dysentery* and *diarrhœa*, 5 per 1,000. The nearest approach to it is 2·8 in Assam. The same remark applies to the mortality due to "all other causes." The ratio under this head (11) is higher than in any other province during 1890. Madras comes next with 10, and then the Punjab with 8, and the Central Provinces with 7 per 1,000. The variations in the ratios recorded in different parts of Berar are remarkable. In the districts we have the extreme averages of 4 per 1,000 in Wun, and 18 per 1,000 in Buldana. In the towns the rates range from nil to 23. These contrasts must be in great measure due to errors in registration, but as the classification of disease falls to be made by ignorant villagers, they can hardly be wondered at. People generally can tell cases of *cholera* and *small-pox*

with tolerable accuracy, and *injuries* also ought to present no difficulty; but as for the other headings, we fear, especially so far as the rural population is concerned, they must be taken in the aggregate. At the same time it is very desirable to maintain the existing headings in the hope that as medical knowledge becomes more general, more exact returns may be obtained, first from the towns, and gradually from the villages.

8. *Deaths according to Causes.*—The results recorded in the above paragraphs may be summarised as follows:—

1890.

Population according to Census of 1881 - - - - - 2,620,573.
Births registered - - - - - 111,450 = 42·5 per 1,000.

Causes of Death.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	847	·3
Small-pox	324	·1
Fevers	47,894	18·2
Dysentery and diarrhœa	13,328	5·1
Injuries—Suicide	169	—
„ Wounds and accidents	620	—
„ Snake bite, or killed by wild animals	215	—
Total injuries	1,004	·4
All other causes	29,623	11·3
Total from all causes	93,020	35·4

9. *Relation of Disease to Local Defects.*—We have already cited some information regarding certain localities where cholera prevailed. In the sanitary estimate prepared under the orders of the Government, further data are given under the heads of "Drainage," "Water-Supply" and "Domestic Cleansing," but they are not in sufficient detail to be of much value. Drainage is classed and described as "good," "fair," "indifferent," or "nil." Water-supply as "sufficient" or "scarce," with occasional remarks added as to quality; while domestic cleansing is characterised as "good," "fair," "indifferent," "bad," and "very bad." In very few places is the drainage said to be "good," or even "fair," it is generally described as either "indifferent," or "nil." In some instances the water is said to be brackish. It is generally said to be sufficient, but how far it is open to pollution is not stated. The cleansing is almost invariably reported as "indifferent," "bad," or "very bad." There is a separate statement which includes a summary of the original reports received from municipalities. In this it is intended that the condition of these eight towns should be tabulated as respects sanitary works, water-supply, drainage, and conservancy, and a column is added regarding the general health of each during the year. This statement might be made much more useful by bringing defects in existing conditions more fully and prominently to notice year after year. From the last column we learn that influenza was prevalent in Berar during the year. In five out of the eight places it is said to have prevailed for a few months. No doubt many interesting and important facts in the history of this widespread epidemic might have been ascertained from these places and from other parts of the province. It would appear that further information regarding local conditions is contained in certain notes of surveys of towns and villages by the Sanitary Commissioner which were furnished in Appendices III. and IV. to the Sanitary Report for the year, but it would seem that the appendices were not printed, for they do not accompany the Report.

10. *Sanitary Works.*—No work of any magnitude was undertaken by any municipality during the year. Financially the municipalities seem to be in a depressed state, as they are said to "have "neither funds nor credit for raising loans." Their incomes seem to have been exhausted on current expenses for keeping up conservancy and other establishments. The system of conservancy adopted is open to objection. It appears that in all the municipalities, the night soil is trenched, but "the trenched land is not cropped, as has been repeatedly advised." This is a serious omission, which ought to be made good, not only because money might thereby be raised for municipal purposes, but also because the trench system without after cultivation is altogether incomplete. The prejudices of the people are against the use of such manure, but so they were more or less all over India. In some parts, however, by persistent effort these prejudices have been overcome with great advantages both to conservancy and municipal funds. The Public Works Department spent considerable sums on sanitary works, of which the more important were a new tank at Chikalda, concrete drains at Murtizapur, and water-works both at Amraoti and Buldana.

11. *Sanitary Board.*—It had been arranged that instead of one provincial Sanitary Board in Berar there should be district and village boards, and some proceedings of the Akola Board appeared in the Report for 1889. As for the sanitary survey of towns and villages, it was further determined that the first survey should be made by the Sanitary Commissioner, that next the executive engineer should be called in, and that then their joint recommendations should be made over to the Local Board concerned, to be carried out as funds would admit. We observe from the despatch of the Government of India, No. 1, Sanitary, of 1892, dated 13th January, that some account of the working of this system was contained in Appendix IV. of the Berar Sanitary Report for 1890, but this Appendix is not attached to the Report. Without the information referred to, no opinion can be

formed as to the probable value of this plan of operations or how far it has been attended with success. In regard to village sanitation, we learn that steps have been taken to ensure more careful observance of the rules of 1880, as the following extract will show: "The members of the village "sanitary boards are now required to supervise the working of the Sanitary Code, and to report "any continued neglect of these rules, as well as to submit quarterly reports based on the "requirements of the Code. A summary of these reports setting forth the points requiring special "notice is laid before the District Sanitary Board at the half-yearly meetings, and it is the duty of "the district magistrate to carry into effect the recommendations of the Board. The accuracy of "the village reports is tested by officers inspecting the villages, a copy of the report being kept for "this purpose by the *patel*. The results obtained by the working of these rules have so far been "encouraging. Surface cleanliness of village sites is more general, and the manure heaps which "formerly occupied any spare corner in the street or house enclosures are being gradually removed "to the outskirts. Boundaries are demarcated generally by posts within which people are not "permitted to answer the calls of nature. Wells are being protected where necessary by parapets, "and prickly pear and other cover removed round villages."

12. *Vaccination.*—We have already considered vaccination in connexion with the effect it appears to have had in limiting small-pox in Berar, the only practical test to which it can be subjected, and we found much evidence of good work in the favourable results. So far they are very favourable, but the test is not one to be applied only at intervals. It should be applied constantly, and, as far as possible, in detail, year after year. Time will try the results, and they will be specially tried in seasons when those causes which induce epidemics of small-pox come into play. It is therefore essential for success that the working of this branch of the Sanitary Department should be under strict supervision, and we are glad to see from the separate Vaccination Report for the year 1890–91 that the results were verified to so large an extent by actual inspection. Leaving out Akola, the superintendent of which was laid up by illness, this verification by superintendents varied between 51 and 74 per cent. of the total operations in each district. By Civil Surgeons the proportion of verification ranged between 22 and 81. No reason is given for the small percentage of verification carried out by the Civil Surgeon of Ellichpur. The total number of vaccinations performed during the year (103,796), the number of primary operations (89,473), the percentage of success in both primary and re-vaccinations (95·1 and 29·5), and the average number of operations performed by each vaccinator are all satisfactory. It is also important to note that the number of infants, and other children successfully operated on was so large; of every 100 persons successfully vaccinated, 85·8 were infants under one year, 12·9 were children between one and six, and 1·2 were of more mature age. Arm to arm vaccination had been nearly supplanted by animal lymph, which the people much prefer, for they think it is more efficacious, and that it is less likely to produce sores. In 1890–91, of the total operations, 85·6 per cent. were performed with animal lymph, and only 14·4 from arm to arm. The Sanitary Commissioner is of opinion that in future arm to arm vaccination may be dispensed with altogether.

10th June 1892.

No. 13.

Memorandum by the Army Sanitary Commission on the Administration Report of the Commissioners of the Town of Calcutta for 1890–91.

1. *Want of Uniformity in the Plan of Report adopted by the three Presidency Towns.*—This Report is for the year 1890–91, but the portions of it which relate to the public health and the statistics of births and deaths are for the calendar year 1890. These health matters are dealt with very fully. A large portion of the chairman's general report is devoted to them, and there is besides a special and very interesting report by the Health Officer of the town, who also appends two memoranda on very important matters, one on the organisation of the Calcutta Health Department, and the other on the relation between cholera and pilgrims. Last year we embodied our remarks on the municipal reports of the three Presidency towns for 1889–90 in one memorandum. We then observed that much would be gained in simplicity and convenience if a few standard forms were adopted by all three for recording the annual vital statistics, and an examination of the reports for 1890–91 induces us to repeat this suggestion. With all the numerous and voluminous tables now given, more especially in the Calcutta and Bombay Reports, it is often difficult to find the particular information required, and when found there is not unfrequently a doubt whether the figures illustrative of this point are the product of the same method of computation. Much may be learned by comparing the experience of one town with another, and discrepancies, which are at first puzzling, may in this way be explained. It is all the more difficult to compare the statistics of 1890 in the three Presidency towns, because while Madras has wholly, and Bombay has in the main, adhered to the Census of 1881 as the basis of their calculations, Calcutta has, so far as possible, taken the Census of 1891. It would have been simpler if the old standard had been preserved in all of them until the full decennial period had been completed.

2. *The Census.*—The census, which was taken on the night of the 26th February 1891, records a total population of 681,599 in the town of Calcutta, of which 446,747 were males, and 234,812 females, or a proportion in every 100 of 64·1 males, and only 35·9 females. These figures include the whole of the town, which has been largely extended by the inclusion of the urban portion of the

suburbs. This has raised the area from 6 to 18½ square miles, and the population by over 50 per cent. If the town within its old limits be taken, it appears that the population has increased from 401 671 in 1881 to 436,893 in 1891. Such increase, however, is not due to excess of births over deaths. From a sanitary point of view especially it must be borne in mind, as the special census officer has remarked, that "the main population of Calcutta is not home born, but imported, and "that the immigrants are generally of the male sex only, which accounts for a disproportion of males "to females by almost two to one." It is worthy of notice that the inclusion of the suburbs, which were supposed to be inhabited by a larger proportion of resident families than the town proper, has not diminished the marked disproportion between the sexes, for it appears from an examination of the statistics made in the orders of the Local Government on this Report, that the percentage of females is slightly less than it was before the new area was taken in.

3. *Vital Statistics. Births.*—The vital statistics for Calcutta proper and for the amalgamated area are as usual given separately, but in future they will also be dealt with as one. In the town proper during 1890 there were 7,948 births, equal to 17 per 1,000 on the Census of 1891, which is almost the same ratio as that obtained in 1880 and 1881, on the Census figures of 1881. The details given in Table XXXVII. show that the average ratio of 17 for the town is made of very different ratios for individual registering sections, in which there are variations between 3·7 in Waterloo Street, a business quarter, and 30·7 in Hastings. Similar particulars for the added area are contained in Table XLVI. The birth-rate for this area, as a whole, was 18·4, or slightly more than that of the town proper. The registering sections taken separately yield rates varying from 10 to 25 per 1,000 These extremes, both in the town proper and in the added area, are evidently largely dependent on the proportion of the sexes in each, but this explanation by no means accounts for the discrepancies in all cases, as may be seen by reference to the two tables mentioned, in which the numbers of males and females in each registering section are entered. The ratio of male births to every 100 female births was 107 for the town proper and 119 for the suburbs.

4. *Deaths.*—The deaths in Calcutta proper during 1890 numbered 12,382, a considerable increase on 11,682, the total for 1889, but the rate, being calculated on the Census of 1891, is given as 26·5, whereas that for 1889, being calculated on the Census of 1881, appears as 26·9, or only slightly in excess of the rate given for 1890. The greater number of deaths in 1890 as compared with 1889 is attributed to an increase of fevers, to an epidemic of influenza, and to another of small-pox, but in spite of all these the general death-rate of Calcutta proper during 1890 was not unfavourable when compared with other years. The registering sections show death-rates of great diversity, from a maximum of 38·5 in Hastings to 11·1 in Waterloo Street. In the added area the mortality was greatly in excess of that in the town proper. It equalled 37·2 per 1,000, ranging from 23·2 in Moocheepara to 41·3 in Alipore. The ratio of male deaths to every 100 female deaths was for the town proper 136, and for the suburbs 142. The causes of this mortality and the proportion each contributed in the town and suburbs are compared in the following statement:—

Calcutta.	Ratio of Deaths per 1,000 of Population.						
	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	All other Causes.	Total.
Town proper - - -	2·0	1·3	8·9	2·8	·49	10·7	26·5
Added area - -	4·2	·8	12·3	6·7	·51	12·6	37·2

It will be observed that under every head, excepting small-pox, the mortality in the suburbs was in excess of that of the town proper.

5. *Deaths according to Age.*—On the relation of deaths to age no information appears to be given regarding the population of the suburbs. In the town proper the death-rate is returned as having averaged 273·3 among infants of all classes under one year. Among Christians the ratio was lowest (163), next come other classes with a ratio of 203. Hindoos 281, and Mahommedans with a maximum of 287. Taken according to sex, the rate among male infants was 268 and among females 278. The greater mortality among female infants deserves notice, as the reverse is recorded in all the provinces of India. In all of them there is an excess of male infant mortality, and in most of them this excess is very marked, but, as we have already remarked in our memorandum on the Central Provinces Report for 1890, the figures seem rather to indicate imperfect registration than to represent actual facts.

6. *History of the Chief Diseases. Cholera.*—The year was remarkable for the small number of deaths from cholera; only 963 were attributed to this cause in Calcutta proper, compared with 1,079 in the year previous. Both years contrast favourably with the records of the past. In only two of the preceding 25 years had the number been lower than in 1890. The diminution was coincident with an extension of the water-supply. A new pumping station had been brought into operation in Halliday Street, and the wards which more immediately benefited by this measure manifested a decided decrease of the disease. In these four wards the cholera deaths, which had amounted to 790 in 1888, fell to 429 in 1889, and to 298 in 1890. The average death-rate from cholera in the town proper was 2 per 1,000, but it varied greatly in the different wards. In Hastings there was a maximum of 4·1, while in Park Street there was a minimum of ·64. In the amalgamated area also

there was a decided diminution of cholera, for the number of deaths recorded under this head fell from 1,236 in 1889 to 916 in 1890. The mortality equalled 4·2 per 1,000, or more than double the ratio for the town proper. The highest death-rate from cholera in any one ward of the amalgamated area was 7·0 in Watgunge, and the next highest, 5·5, in Alipore. In Moocheepara it was only 1·4. In the first quarter of the year an outbreak of the disease occurred, which the Health Officer attributes to importation and the emanations from sewers into which cholera dejecta had been discharged. He says that about the 6th February "it seemed apparent that the disease was "following the lines of drainage and sewerage, and this view was further supported by cases "occurring close to the openings of the sewers, from which very offensive smells were proceeding." Further on he adds, "At night and in the early morning the misty and still state of the atmosphere "favoured the giving off from the sewers and drains emanations which were very perceptible to the "sense of smell and hurtful to those more immediately exposed to them." The statement that the hurtful nature of these emanations depended on the fact that the drains contained cholera dejecta requires much more proof than has been advanced in support of it, but it is satisfactory to learn that early measures were taken to remedy this insanitary state of things. The drains were cleaned, and the outbreak soon ceased. The supposed importation of cholera in February 1891, and the general relation of pilgrims to the spread of the disease over India, are discussed at length by the Health Officer in one of the two papers appended to his report; we shall deal with it in a subsequent part of this memorandum.

7. *Small-pox and Vaccination.*—The year was marked by an epidemic of small-pox and a larger number of deaths from this disease than had been recorded for 10 years. During these last 10 years the total had varied between a maximum of 478 in 1884 and a minimum of two in 1877. In 1890 the total was 700. In the added area also there was a considerable increase, from 28 in 1889 to 172 in 1890, but the death-rate from small-pox was not so high here as it was in the town proper, 8 compared with 1·3. In both parts the disease was very unequally distributed. Owing to the epidemic the vaccination staff were unusually active, and the operations performed exceeded those of the year previous by 1,819 primary cases, and 7,377 re-vaccinations. The percentage of success attained was 88 for primary and 20·39 for re-vaccination. The compulsory Vaccination Act was carefully carried out, so that all children born should be protected within their first year. Amongst such a floating population as that of Calcutta, an Act of this kind is more difficult to administer than in an ordinary town, and at the same time there are special hindrances in the way of making exact comparison between the extent of successful vaccination and small-pox mortality in individual wards.

8. *Fevers and influenza.*—In Calcutta proper 4,154 persons died of fevers, the largest number since 1879, when it stood at 4,796. The mortality equalled 8·9 per 1,000. The Health Officer attributes these results to the leaking of the Calcutta sewers, and the consequent pollution of the soil. It would seem, however, that this remark regarding the leaking of the sewers, which is based upon Mr. Baldwin Latham's report on the drainage of Calcutta, makes too much of what had been said by that authority. Any pollution of the soil would be very dangerous to the public health, but as a matter of fact the engineer of the corporation, on examination of sewers of all sizes, has been unable to discover any evidence that it had taken place. Moreover, as the Lieutenant-Governor remarks, the experience of Calcutta in this, and all other health matters, must be considered in connection with what is happening in the surrounding country, and the statistics of Bengal show that fevers were unusually prevalent in the Presidency division, and in the small municipalities around Calcutta. We observe further, as bearing on this question of the high fever death-rate in 1890, that the different wards suffered in very different degrees. In Hastings there was a maximum of 17·8 per 1,000. In seven other wards the ratio was about 10 or 11, while others again return much lower rates. It would be interesting to know how far these ratios accord with the presence of imperfect sewage, or of other local insanitary conditions. In the added area the fever deaths were in exactly the same proportion as they had been in the year previous, 12·3 per 1,000, but this ratio is much in excess of 8·9, which, as has been already stated, was the rate for Calcutta proper during 1890. In several of the wards of the added area, to which area the sewers have not yet been extended, the fever death-rate was much higher than the highest recorded in the wards of Calcutta proper. It might be concluded, judging from the experience of other parts of India, that the fever mortality had been unduly swelled by the inclusion of deaths from influenza, but the Health Officer observes that few deaths happened from influenza in Calcutta compared with the number recorded in other towns. "The city," he says, "was fortunate in escaping with a mild type of the disease." He states that "the disease was clearly imported from Bombay" by merchants, and that from the business quarters it soon spread to the other parts. Whatever may be the truth on this point, and we can form no opinion on the facts regarding Calcutta without much more exact and detailed information than is given in this Report, it appears to be established beyond all doubt that the influenza prevailed over great part of India during much the same time, that it disappeared as mysteriously as it had come, and that if it were really due to contagion, as the Health Officer of Calcutta seems to believe, no measures which could have been taken to prevent its entrance would have succeeded.

9. *Sanitary Defects.*—Among the sanitary defects mentioned by the Health Officer we have already noticed the offensive emanations from certain drains, which he has connected with cholera, and the supposed leakage of the sewers, which seems to have been too hastily assumed as the cause of the more than ordinary mortality from fevers. In addition to these, he makes special reference to the insanitary conditions at Kalighat, which he has described in his memorandum on pilgrims, and which, it is satisfactory to learn, the municipality was endeavouring to remedy. Attention is again drawn

to the remarks made in the Report for 1889 regarding the insufficiency of the existing building regulations to prevent the construction of insanitary dwellings, and illustrations are given of the evils which are growing up under these regulations and which it will be extremely difficult to deal with hereafter. With a view to the extension of the drainage to the amalgamated area, Mr. Baldwin Latham, an eminent engineering authority on such matters, was asked to report on the whole question. His report is given in full, and discusses not only the projects for extending the sewerage into the newly acquired area, but also the improvement of the works within the city, especially as regards the provision of more adequate flushing arrangements and the ventilation of the sewers, in both of which respects he considered the existing sewers were defective.

10. *Sanitary Works.*—The engineer to the corporation has submitted a note on Mr. Baldwin Latham's report, in which he expresses his concurrence on many points and his dissent on others. Into these details we shall not enter; it is sufficient to note that estimates have been prepared for carrying out improvements in the old sewers, and for extending the system to the amalgamated area. Among these improvements are the flushing and ventilation of the sewers, with increased pumping power at Palmer's Bridge. The total estimates which were being considered by the municipal commissioners amounted to Rs. 17,069,527. During the year, under the head of sewer construction, nearly 2 miles of stoneware pipes were laid in the Bustee Road, and 4½ miles of stone channels for surface drainage in various streets, 76 flushing chambers were constructed, 680 premises were connected with the sewers, and 6,736 house drains examined. Under the head of water-supply also good progress continued to be made. On the filtered system 47 miles of mains and services were added during the year, the total amounting to 231 miles. On the unfiltered system 2 miles were added, raising the total length to 66 miles. The number of premises connected with the filtered service amounted to 19,850, of which 657 were added during the year. Another most important work connected with the water-supply was the erection of a new pumping station at Bhowanipore Thirty-eight tanks were operated on during the year, of which one was de-watered and re-excavated, and the other 37 filled up. In conservancy cleansing and inspection there was commendable activity.

11. *Organisation of the Health Department.*—We turn now to the memorandum on the organisation of the Calcutta Health Department which Dr. Simpson has appended to his report. In this it is shown how the Health Department gradually grew up, what the staff now consists of, and how the various duties are carried out. Certainly these duties are multifarious and onerous, and must tax the energies of both the Health Officer and his subordinates to the utmost. They include such large matters as the conservancy of the town, medical inspection, food inspection, laboratory work, vaccination, and registration of births and deaths, to which may be added the filling up of tanks, the burning of refuse, the serving of nuisance notices, and other minor details too numerous to mention. It is to be remembered, moreover, that in 1889, by the inclusion of the suburban area within the town limits, Calcutta, as already stated, was increased from 6 to 18½ square miles, and the population increased by nearly 50 per cent. Much most excellent work is done, but when the task is so enormous it is most important that nothing should be attempted which is not beyond all doubt useful, and such, moreover, as it is within the powers of the Health Department to accomplish. From this point of view we should like to have had more particulars regarding "Medical Inspection." Some details are given at page 76 of the Health Officer's report, but it does not appear exactly what is done in order "to compel private individuals to take care not to endanger the public health from epidemic or endemic diseases from which they may be suffering," which Dr. Simpson lays down as one of the chief duties of the Health Department. We fear that in this matter an attempt is being made to accomplish what is, practically, an impossibility; that, especially in an oriental city, such an attempt is attended with great risk, not only lest personal liberty should be unduly interfered with, but also lest the people should, by measures which seem to them oppressive, come to regard the whole of sanitation with extreme aversion. It is most important that the Health Department should be kept informed of the occurrence of disease, and more particularly of epidemic disease, but the object should be not so much to deal with the sick persons as to ascertain the local causes of this disease, and to see that measures are taken for their removal. The experience of Calcutta since sanitary improvements were taken in hand has shown very conclusively how vastly the public health is benefited by such improvements, especially by more efficient cleansing, by drainage, and an ample supply of good water, and the great object of the Health Department should be to make these and other like improvements more perfect still, as the best and only real preventative of disease.

12. *Relation of Pilgrims to Cholera. Statements regarding Khalighat.*—The second memorandum by the Health Officer is devoted to a consideration of the relation between pilgrims and cholera. He believes that pilgrims are one of the great means by which the disease is disseminnated over India, and in support of this proposition he instances the facts connected with the gatherings at Kalighat, in the suburbs of Calcutta and at Hurdwar, in the early part of 1891, both of which came under his own personal observation. We shall take the facts regarding Kalighat first. To this temple pilgrims flock at all times of the year, but early in February 1891, owing to some special occasion, there was an unusual gathering of them, and during the first two weeks of that month it is estimated that 150,000 of them arrived in Calcutta. In the last half of January, 12 deaths had been reported among pilgrims and none among the residents of Kalighat. The first resident there died on the 1st Febuary, and up to the end of the month 18 more deaths occurred among residents. During this same period a somewhat sharp outbreak had been occurring among the pilgrims, of whom 238 died, so that with the deaths in the second half of January, 250 pilgrims in all had fallen victims to cholera in Khalighat. The gathering broke up, the pilgrims dispersed, some died in boats and some

on the road, but the number of these is not known. Some of these, it appears, were not returning from Kalighat, but from another fair. The place is immaterial. The question to be answered is, did these pilgrims spread cholera in the villages. In order to obtain information on this point, a circular was sent out to the postmasters of about 100 villages in different parts of Bengal. The replies from 26 of these villages, situated in the districts of Midnapore, Howrah, Khulna, Sylhet, and Jessore, state that in all but three the first person attacked was a pilgrim. In 13 of the 26 other residents suffered, but the number was very small in each. There was nothing approaching to an outbreak in any of them, generally only one or two cases.

13. *Information collected from certain Districts.*—The replies from postmasters in only five instances state how long the villages in question had been free from cholera before the pilgrims arrived. One is said to have been free for two months, one for "a year or so," two for two years, and one "for many years." In the statements furnished by civil surgeons and assistant surgeons in civil medical charge, more information is given on this point. We shall very briefly summarise the data which have been obtained from this source regarding the nine districts concerning which they are given.

Burdwan.—Five villages specially reported on. All said to have been "infected," four by pilgrims, and one by a boy coming from an "infected village." In 2 of these, cholera had not been known for two years, in 1 for 5 or 6, in 1 for 8, and 1 for 15 years.

Bhaugulpore and Noakally.—From both of these it is reported that the pilgrims had no influence on cholera prevalence.

Rungpore.—It is reported from eight towns situated in Rungpore and six other districts that the first person attacked in seven of them was a pilgrim, and that in the eighth "he was in a family visited by a pilgrim who was apparently himself in good health." The number of pilgrims attacked is not distinguished from the residents; in all the towns where stated the number of residents attacked varies from 3 to 9. Excepting Dingapore, the places had been free from cholera for a very short time, from 3 weeks to 11 months. In Dingapore it is said that "cholera had not been known in the town for many years."

Burdwan.—Eleven villages and the town of Burdwan itself. In all but three the first case is said to have been in a pilgrim or family of a pilgrim. In eight of these places cholera is said to have been unknown for eight years.

Dinagepore.—Fourteen villages, 399 cases, of which 131 were pilgrims. In 12, first case said to have been in a pilgrim, and in the two others in a pilgrim's family. The places had been free from cholera 2 for 1 month, 2 for 1 year, 1 for 2 years, 6 for about 10 years, and 3 for 25 years.

Bogra.—Six villages, 1,078 deaths. Number of pilgrims not separately stated. First cases in all said to have been pilgrims or "connected with pilgrims." Had been free previously 1 for 1 year, 3 for 2, 1 for 5 years, and 1 for 6 years.

Rungpore.—Cholera existed in three of the 21 thanas and outposts in January. In February it spread all over the district. "It was chiefly confined to the pilgrims." No particulars of previous outbreaks.

Goalundo.—Cholera not severe. Out of 27 villages reported on, it was present in five prior to the return of the pilgrims. In the other 22, first cases said to have been among returned pilgrims or their families. In the 22 altogether only 53 deaths. Pilgrims and non-pilgrims not distinguished from one another.

Fureedpore.—No particulars given, except that after the return of the pilgrims, 1,634 deaths occurred. "It was impossible to ascertain whether pilgrims were first affected in these villages, or their friends, or their neighbours.

Jessore.—A list of 89 villages is given, but the data are not complete. In 21 of them, first case said to have been a pilgrim, in 22 not a pilgrim, in others "unknown." The places had been previously free from cholera for periods varying from nine months to five years. From the evidence he has advanced, and of which the above is a short summary, the Health Officer concludes that by the returned pilgrims "in three districts at least a widespread epidemic has been set up."

14. *Proneness of Pilgrims to Cholera.*—That pilgrims are peculiarly subject to be attacked by cholera is a well-known fact, and one on which we have frequently insisted. It is fully illustrated in this Report. In Calcutta, for example, the deaths among pilgrims and residents during the months of January, February, and March 1891 were as follows:—

	Town.			Suburbs.		
	Total Deaths.	Residents.	Pilgrims.	Total Deaths.	Residents.	Pilgrims.
January - - -	137	131	6	123	99	24
February - - -	523	258	223	624	284	340
„ - - - -	—	42*	—	—	—	—
March - - - -	154	138	16	181	166	15

* Strangers, not known whether pilgrims or not.

Omitting the month of March, by which time the pilgrims had nearly all left, in both the town and suburbs the pilgrims suffered in far larger proportion than the residents. Nor is this to be wondered at, exposed as they had been to all the vicissitudes of weather, fatigued by travel, overcrowded, and impelled by their religious feelings to drink the filthiest water, even although good water was provided for them. It is only necessary to read the description of the circumstances in which they were placed at Kalighat to see that these circumstances were most favourable to their suffering from cholera. Moreover, it is beyond all question that the results were not confined to those which immediately followed, but that they also manifested themselves for some time afterwards; many of the pilgrims were attacked after they had dispersed in railway trains, in boats, on the road, and after they had reached their homes.

15. *Supposed Dissemination of Cholera by Pilgrims. Evidence imperfect.*—All this is self-evident, but when we come to consider whether these pilgrims, by their dispersion, were the direct agents in causing an epidemic of cholera over Lower Bengal, we are dealing with a very different question. The Health Officer is of opinion, from the information he has collected, that in at least three districts the evidence on this point is conclusive, and that they were beyond all doubt the cause of its spread. In other districts it will be observed from the summary already given, that the facts recorded are not considered sufficient to warrant this opinion, while in two at least there is decided testimony to the fact that the pilgrims were not the cause of the epidemic. Our object is, not to weigh one set of statements against another, but to point out that, even in those districts from which the evidence is considered to be most conclusive, it is very imperfect. There is no attempt to compare the statistics in the early part of 1891, when pilgrims are believed to have spread cholera, with those of the same places in other years, either at the same time or other times when there was no general dispersion of pilgrims to which the prevalence of the disease could be ascribed. It seems to have been considered sufficient to note that the first person attacked in a village was a pilgrim in order to prove that the pilgrim was the cause of the subsequent attacks that may have taken place. But much more than this is required. The dates of the pilgrims attacked and of the subsequent attacks are necessary, and the relation, if any, which existed between them. We have known instances in which such importation was alleged; a pilgrim or other traveller first suffered, and then a resident was attacked, but when the dates were procured it was found that the two cases commenced within such a short time of one another that the one could not have been due to the other, but that both must have been due to one common cause. The health of the village before the pilgrim arrived, especially in regard to any cases at all resembling cholera, is a very important item.

16. *Impossibility of obtaining exact Information from Villages.*—It is quite clear that information of such completeness and exactness cannot be gathered from villages. Even when the reports have been submitted by medical officers it by no means follows that they have had personal cognizance of the facts recorded. For the most part they must trust to the police for the facts, and the police are quite unfitted for any inquiry of this kind. The statements must therefore be received with extreme caution and grave doubt as to their accuracy. The only communities in which such an investigation can be made with any hope of learning the truth, are regiments and jails, where a medical officer is always present and ready to make inquiry on the first suspicion arising. It is worthy of note that the most searching examination of the facts of cholera outbreaks among such communities has by no means tended to establish the theory of importation, or to produce evidence such as is put forth in these village statements. These statements concerning both towns and villages are clearly not to be depended on. According to them many of the places concerned had been absolutely free from cholera for years before the pilgrims returned in 1891, some for five, others for 10, one for 15, and three for 25 years. They bear on the face of them a hearsay and vague character, which stamps them at once as of no value. If, on the other hand, their accuracy is insisted on, then they are in themselves strong evidence against the pilgrim theory of cholera dissemination, for if the villages had kept free from cholera all these years, during which many hundreds of persons must have been going on pilgrimages and returning to their homes, pilgrims cannot be such a source of danger as they are represented to be. But, as a matter of fact, the evidence, whether for or against the pilgrim theory, which is adduced in this Report, is of little or no value. In some instances it is manifestly incorrect. At Dinagepore, for example, it is said that cholera had not been known for many years previous. On turning to the Reports of the Sanitary Commissioner for Bengal we found that in this town in 1890 there had been four deaths from cholera, and five in 1889. Searching still further back we learn that, with the single exception of 1883, when no deaths from the disease were recorded, Dinagepore town has suffered from cholera, more or less, in every one of the 15 years 1876 to 1890.

17. *Evidence of the Disease being governed by some general Cause.*—The pilgrim theory as set forth in this Report altogether ignores the facts which indicate that the results were governed, not by a series of accidents, such as is implied in communication of the disease from one person to another, but by some general cause. Of this there could be no more striking evidence than the statement of cholera deaths in Calcutta week by week, which the Health Officer himself gives for the first quarter of 1891. We shall reproduce it here, leaving out only the column "Mean for past five years," because such a mean is of no value for comparison in a case of this kind. The number of cholera deaths in each corresponding week of each year taken separately would have been interesting information, but the point we wish to illustrate is not the comparison of 1891 with former years, but the synchronous rise and fall of the disease in the town and suburbs of Calcutta in these weeks of 1891.

STATEMENT showing the weekly number of CHOLERA DEATHS during January, February, and March, 1891, in the TOWN and SUBURBS of CALCUTTA.

Period.	Number of Cholera Deaths.	
	In Town.	In Suburbs.
1st to 3rd January 1891	10	9
Week ending 10th January 1891	20	22
" " 17th " "	30	24
" " 24th " "	35	24
" " 31st " "	42	44
" " 7th February "	56	68
" " 14th " "	183	365
" " 21st " "	192	149
" " 28th " "	92	52
" " 7th March "	50	41
" " 14th " "	27	38
" " 21st " "	39	62
" " 28th " "	27	29
29th to 31st March 1891	11	11

The figures are certainly very remarkable. They show the gradual rise in both, the same week of maximum prevalence and then the gradual fall, varied by a slight increase in the week ending 21st March, when both town and suburbs show a temporary increase.

18. *Sanitary Improvements the only practicable Means of preventing Cholera.*—But the point to which we wish to draw special attention is, that however interesting such inquiries as form the subject of this paper on cholera and pilgrims may be from a scientific point of view, they can lead to no practical action. Even if all the statements which the Health Officer has given were accepted as correct, no preventive measures can be based on them. In India, and more especially in Bengal proper, where hundreds of cases of cholera are constantly occurring over a vast area, it is absolutely impossible to prevent persons, be they pilgrims or others, passing from a village in which there are one or more cases of cholera to another which is free from the disease. Such an attempt would involve an enormous cost and an intolerable interference with trade and with all the occupations and social intercourse of the people, and in the end must prove a failure. The sole practical and practicable measures for the prevention of cholera are sanitary improvements, improvements in drainage, water-supply, dwellings, and every other of the many requisites of health.

19. *The Hurdwar Fair and the Comma Bacillus.*—With regard to the Hurdwar fair of 1891, which the Health Officer of Calcutta also visited, we have very few remarks to offer, but they refer to a matter of considerable interest at the present time, when belief in a specific germ as the cause of cholera is so commonly held. Professor Koch only a few years ago was credited with having discovered this germ in the shape of the comma bacillus. The Hurdwar fair was held early in 1891, it is estimated that it was attended by about 700,000 persons, who crowded as usual to the sacred *ghat* to bathe and take the holy water into their mouths. The bathing began early on the 12th April. On examination by Professor D. D. Cunningham, of Calcutta, samples of water taken from this bathing place was found to contain quantities of the comma bacillus. To account for its presence the Health Officer relates particulars regarding five suspicious cases, some, it is believed, of true cholera, and others at least resembling this disease, which had occurred in or about Hurdwar between the 6th and 9th April, and observes: "There was the possibility of infected articles of "clothing being brought to the ghat, even if no infected person bathed there, which is not unlikely, and "this is the only way in which I can account for the comma bacilli being found in the sacred "pool." Had cholera broken out among the pilgrims this would no doubt have been considered as conclusive proof that the comma bacillus is the specific cause producing cholera. It might, and no doubt would have been pointed out that the evidence of a single year was altogether insufficient, and that before any sound opinion could be formed, it is necessary to examine the water in other years and ascertain if these bacilli are present only in cholera years and absent in the many others years in which there is no cholera at Hurdwar. Still the mere presence of the comma bacilli in the Hurdwar water in 1891, if it had been attended with an outbreak of cholera among pilgrims, would have been regarded as a very striking fact, going far to support the belief that the bacilli were the cause of the cholera. Fortunately, notwithstanding the abundance of comma bacilli in the water of the bathing pool in 1891, there was no cholera except the few suspicious cases already referred to; there was no outbreak among the pilgrims either at the fair or on their way back to their homes. With the abundance of comma bacilli there was indeed a remarkable absence of cholera, from which it can only be inferred that an importance has been attached to the comma bacillus in its relation to cholera which is not warranted by the facts. We would suggest that microscopic examinations of the water in which the pilgrims bathe at Hurdwar and other places should be made on several occasions, when there are great gatherings, with a view to ascertain whether these comma bacilli are constantly present or not, especially during the height of the bathing time. We do not offer any opinion on the question, but it seems worthy of investigation whether these bodies, which have been made so much of in connection with cholera, may not be merely the same as those which the late Surgeon-

Major T. R. Lewis discovered to be common in the mouths of healthy persons. When tens of thousands of people were bathing together almost as close as they could stand, and washing out their mouths as part of the ceremony, it is to be expected that such bacilli should be found in abundance.

19th July 1892.

No. 14.

Memorandum by the Army Sanitary Commission on the Administration Report of the Madras Municipality for 1890–91.

1. *Division of Subjects.*—This Report as a whole is for the year ending the 31st March 1891, but the vital statistics, as usual, embrace the calendar year, and refer only to 1890. In noting on them and the other information given regarding sanitary matters for that year we shall follow the general order of subjects adopted in our other memoranda, and discuss *seriatim*:—

1. The state of the health of Madras during that year as indicated by the statistics of births and deaths;
2. The history of the chief diseases—cholera, small-pox, fevers, &c.;
3. The sanitary defects noted in connection with the prevalence of any of these diseases; and
4. The sanitary works or other measures taken to remedy these defects.

We may observe again, as we did last year, that there is no separate report by the Health Officer of Madras. His name appears only at the end of the series of tables of births and deaths, and sanitary, like all other matters regarding the town, are merely summarised in the general report of the Chairman of the Municipal Commission. On several points of importance the information given is not so complete as is desirable.

2. *Census.*—The new census was taken on the 26th February 1891, and full particulars of the results may be expected in the report for that year. It is incidentally mentioned that the population was found to be 451,388 compared with 398,777, the total enumerated in 1881, when the last census had been taken. In the Appendix there is a detailed account of the procedure adopted, which will be very useful for guidance on future occasions. "There is no doubt," it is said, "that the work was systematically and conscientiously performed," and much interesting information may therefore be anticipated in the Municipal Report for 1891. The figures do not form part of this Report for 1890, nor are they employed in calculating the ratios of either births and deaths in the statistical tables, which are all based on the Census of 1881. As we have elsewhere remarked, this is the simplest method which could have been adopted. It would have been convenient for comparison if it had been followed by all the three Presidency towns.

3. *Births.*—During the year 17,569 births were registered (exclusive of 533 infants still-born), or in the ratio of 44 per 1,000, compared with 40·9 in 1889. The large increase is attributed "in part to improved registration and in part to a steady increase in the population" since the Census of 1881, while the ratio continued to be calculated on the figures for that year. It would have been interesting to see how far the rise in the rate had been progressive during the 10 years, but the birth-rates for these years are not given separately. If, however, the total number of births each year be taken as shown in Table II. of the vital statistical series, we do not find any gradual rise. The highest number of births during these 10 years, 1880–89, was 16,523, in 1882. In 1889 it amounted to 16,349, while 1890 returned 17,569, or an excess of 1,220 over the previous year. It is therefore to be hoped that this excess is the result of improved registration. Of the total births during 1890, 9,001 were males and 8,568 females. The tables do not show the percentage of male to female births, which they ought to do, not only for the town as a whole, but also for each division taken separately. This is an important item in all birth statistics. It is provided for in all the provincial Sanitary Reports, and it also finds a place in the statements which we recommended for adoption in the health reports of the three Presidency towns, when reviewing their reports for 1889. Among classes the birth-rate varied from 37 among Europeans, Erusians, and Native Christians all taken together, to 42·2 among Mahomedans, and 45·2 among Hindus. According to locality the birth-rate ranged between 34·7 in the second division of the town and 59·5 in the fourth, but there is no explanation of the local circumstances, if any, which seemed to account for these marked differences.

4. *Deaths.*—The number of deaths during 1890 was slightly higher than in 1889, 17,194 compared with 17,086, or a mortality of 43·1 against 42·8. Taken by caste, the rates were, for Mahomedans 46·1, for Hindus 43·7, and for Christians 34. According to locality, which, from a sanitary point of view, is the most important matter to be dealt with, the mortality varied between 35·5 in the sixth division of the town and 60·5 in the fourth. It is remarked that "this locality is mainly occupied by "parcherries and hutting grounds, inhabited by a very poor class of people. Much of the ground is "low lying and swampy, part of it is land reclaimed by the deposit of rubbish." Only the *total* mortality is given by locality. The proportion in which the different diseases contributed to this total is not mentioned. This information might, no doubt, be worked out from the figures given in Tables XXVI. and onwards of the statistical series, but it is lost in these voluminous tables, and therefore does not meet with the attention it deserves. Moreover, it is essential for forming accurate deductions that the results should be considered in connection with other factors at work, of which the most potent would appear to be the extent of the infant population in the locality concerned.

5. *Enormous Death-rate among Infants.*—How potent this fact is may be judged by the enormously high rate of mortality recorded among children. During 1890 it would appear that this amounte l among those under one year to 579·7 per 1,000, or if the number of such deaths be taken in conjunction with the actual number of births during the year "it is found that about two out of every three survive." In 1889 the ratio was 583 per 1,000. In considering the total mortality of Madras for 1890, it is to be remembered that of the 17,194 deaths in all, 5,829 were recorded as having occurred in infants under one year. There is, however, another remarkable fact in these statistics of mortality in Madras, according to age, and this is, that while the rate among infants under one year is so much higher than it is in other parts of India, the rate among children between one and five is lower. In Madras, during 1890, this is recorded as 60·9. The different periods of life adopted by Calcutta and Bombay prevent exact comparison between the results in these towns and those above quoted from Madras, but in our memorandum on the Sanitary Report of the Central Provinces for 1890, we have compared the ratios of mortality among infants under one year, and also among children above one year and under five, and on reference to the table there given we find that in the North-West Provinces, the Punjab, the Central Provinces, and Hyderabad the death-rate among infants is much lower than in Madras, while among children between one and five it is, as a rule, much higher. There seems reason to infer from both the Madras returns and those of several of the provinces that the death-rate among infants is exaggerated by under-estimating the age of the children. In addition to "bad sanitary surroundings" the excessive mortality among infants in Madras is ascribed to the treatment they receive during this trying period of life.

6. *Deaths according to Sex and Cause.*—More definite information is desirable regarding the percentage of mortality of males to females. This percentage should be recorded. According to cause the statistics of the two years 1889 and 1890 are thus compared :—

	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Other Causes.	Total.
1889, number of deaths - -	45	1,204	4,154	2,993	182	8,508	17,086
1890 „ „ - -	78	412	4,685	2,704	744	8,571	17,194
Mortality per 1,000 of population in 1890.	0·1	1·0	11·7	6·7	1·8	21·4	43·1

From the above it will be seen that small-pox, fevers, and cholera had increased, while under measles the mortality was greatly reduced. There was some reduction under dysentery and diarrhœa. Under *other causes* the two years yielded very nearly the same results. The very large proportion of the total mortality recorded under this head of *other causes* is worthy of notice. In both years they accounted for nearly one half of all the deaths.

7. *History of the Chief Diseases. Cholera.*—As shown above, the number of deaths from cholera rose from 182 in 1889 to 744 in 1890. The disease was more prevalent than it had been in any year since 1884. The account given of it is that "the epidemic commenced in the month of July, when 39 deaths were registered." The disease is said to have been imported from Pariapalium, a place of annual pilgrimage, which is largely resorted to by certain classes of Hindus. It was reported first in Royapuram, and then quickly spread through the Tinnevelly settlement. The condition of this quarter is thus described, "The stagnant ditch drains of that part of the town are full of sewage mixed with paddy water." No details are given as to the history of supposed importation. We observe that in the first quarter of the year 29 deaths had occurred from cholera in Madras, and that these had been spread over seven out of the eight divisions of the town. There was thus ample evidence of its widespread presence in the early months of the year. During the following three months no deaths from cholera was reported. In July, four out of the eight divisions furnished fatal cases. The epidemic was most severe in August and September, in October it had greatly diminished, and in November was represented by one solitary death in the whole town. The precautionary measures taken were to engage an extra staff "to maintain the cleanliness of the diseased areas, disinfect the huts and houses, and burn the contaminated clothes and bedding." A number of suspected wells were also closed. Without much more detailed information it is difficult to judge of the effect of these last measures. The Chairman of the Municipal Commission expresses the opinion that "the north-east monsoon finally put an end to the epidemic." That cholera is intimately associated with season is a fact which is very generally admitted, but it would require the statistics of years to be adduced before the statement that cholera disappears from Madras with the north-east monsoon could be accepted as correct. The practical question, however, which has to be dealt with does not concern the monsoons or other atmospheric phenomena, which, however powerful their influence, cannot be controlled. One important question arises,—can importation, to which this epidemic is believed to have been due, be prevented? Can Madras or any other town be so guarded that no person suffering from cholera can find entrance? The answer must be that this is impossible, and that any attempt to prevent such entrance must be attended with great hardship to the people. The only practical way of dealing with cholera in common with all other diseases is to search out when it occurs, and still more when it prevails, what are the local disease causes with which it is associated, and remedy them as far as possible. In this instance, so far as Royapuram is concerned, these disease causes were not far to seek.

8. *Small-pox and Vaccination.*—Although, as already shown, small-pox deaths were more numerous in 1890 than they had been in 1889, 78 compared with 45, the number was still small. With this happy result vaccination is to be credited. In 1890–91, the year with which the vaccination figures are concerned, 24,768 operations were performed, or an increase of 266 on the year previous. The percentage of success in all, taken together, is recorded as 97·24. In the primary cases, which amounted to 22,945, the percentage of success is given as 99·29, and in the 1,823 re-vaccinations 90·82. Attention is drawn to the fact that "the percentage of success in primary vaccination was higher than in re-vaccination." But this result is only what was to be expected. The percentage of success in re-vaccinations is in fact so very high as to throw doubt on the accuracy of the returns. The proportion of work done among children is most satisfactory; of the total of 24,768 vaccinations, 15,709 were performed on infants under one year. If the vaccinations among infants of this age be compared with the registered births, it appears that, after deducting the deaths at this period of life, the number vaccinated was really greater than the number of infants available, but this apparent anomaly is explained by the fact that all the infants operated on were not born in Madras. It is not said what check is exercised over the returns, or how far the numbers vaccinated and the proportion recorded as successful have been verified by actual inspection. In paragraph 141 of the Report, the number of deaths from small-pox in 1890 is quoted at 92, but this does not accord with the figures which appear in the statement appended to paragraph 158 or with those in the general table of vital statistics.

9. *Fevers, &c.*—The mortality from fevers was considerably higher in 1890 than it had been in 1889. The deaths under this head numbered 4,685 compared with 4,154. No account is given of the probable causes which led to this result. The average deaths from fevers during the previous 10 years is stated as 3,716; from the annual figures, which are recorded at page 48, we find that the total for 1890 is the highest in any one of the 10 years which are there compared. In 1888 there was a minimum of 3,372 deaths from fevers. The nearest approach to 1890 was in 1889, when the total stood at 4,152. The great diminution of mortality under the head of measles has been already referred to. No mention is made of influenza. The Sanitary Commissioner records in his Report for 1890 that this disease was very prevalent in the Madras Presidency during the early months of the year. If the town of Madras escaped the epidemic the fact deserved notice in the history of the year. If, on the other hand, it suffered, a full account of the epidemic should have been given. The information given concerning dysentery and diarrhœa, and the other heads under which the mortality is recorded, does not call for any remark, except that further particulars regarding the proportion in which these diseases affected the different parts of the town, and the degree in which this proportion varied from the results in other years would have been of interest.

10. *Sanitary Defects.*—In connection with the high rate of mortality in the fourth division of the town, with the enormous death-rate among infants, and with the severity of cholera among the paddy boilers in Royapuram, some information has been extracted from the Report regarding local insanitary conditions; and some further particulars are to be found in the chairman's general remarks on conservancy. Although much was done, the state of things in many quarters was still very unsatisfactory. In the fourth, fifth, and eighth divisions there was as yet no house to house conservancy. "One of the chief difficulties in street conservancy is the filthy custom of too many "of the inhabitants who use the streets and lanes as latrines. This is so bad in some parts of the "town that whole lanes have to be frequently scraped and the earth removed and fresh sand put "down. If this were not done the stench would become considerable." Another evil is the practice still resorted to, to some extent, of "filling putrid tanks and low-lying ground not far removed from human habitations with street sweepings containing a large amount of putrescible garbage"; a tramway is advocated in order to remove all rubbish to a distance. The greatest evil of all is thus described: "The drainage is probably the worst feature of the Madras municipality, and is directly "or indirectly the principal cause of the heavy mortality, directly from the foul gases emanating "from them and pervading the houses built close to them, and indirectly through the sewage "percolating into the wells, the water of which is still largely used in some parts of the town." In the health portion of the Administrative Report of the municipality it is very desirable that the connection between such and other local conditions and the prevalence of disease should be dealt with as fully as possible. The object in every Sanitary Report should be to endeavour to localise disease causes, so that these disease causes may be removed. For this purpose it is essential as the first step that the history of disease should be localised as far as this can be done. The incidence of disease among different nationalities and creeds to which many of the tables are devoted, however interesting, does not afford the same practical basis for reforms as the incidence of disease according to locality. It is therefore of great importance that the facts regarding locality should be clearly and fully stated—the extent of all the chief diseases in each, a description of any sanitary defects in each locality to which the prevalence of disease appears to have been due, and an account of the steps which are being taken for their removal. Doubtless in a large city like Madras many serious defects exist which cannot be dealt with at once, but it is none the less necessary on that account to give them a prominent place in the annual Health Report year after year so long as they exist.

11. *Sanitary Works.*—In Black Town the portions of sewer No. 2, which were found in the former year to be damaged and leaky, were rebuilt, and since the close of 1890 they have been brought again into use. Up to end of March 1891, Rs. 10,58,635 had been expended on this scheme of drainage for Black Town, and only 1,196 feet of surface drains remained to be constructed. A number of house drains were altered and repaired by the municipality. A scheme for the drainage of Mylapore awaited the report of a special committee on the general question of the drainage and

water-supply of Madras. A number of streets were provided with new drains, and the drainage of the Royapuram Infantry lines was connected with sewer No. 1. Under the head of water-supply, considerable progress was made in laying pipes, providing fountains, &c., but the supply of water had fallen to 16 gallons per head, and its quality had still further deteriorated. Improvements are much wanted in both drainage and water-supply, and it is hoped that measures may soon be taken to secure these most important objects. It is noted in the orders of the Madras Government on the Report that "the contemplated improvements in the drainage and water-supply of the town and in the sanitation of the Coum River" were under investigation by an expert from England. The Conservancy Department was active, and the amount of rubbish and night soil removed from the town was very large."

19th July 1892.

No. 15.

Memorandum by the Army Sanitary Commission on the Administration Report of the Municipal Commissioner of Bombay for the year 1890–91.

The Census.—In noting on this Report we shall take up the various important matters to which it refers in much the same order as that we have followed in dealing with the other reports, but the remarks we make shall be brief, because in Bombay the year 1890 was comparatively healthy. The facts, moreover, are already very clearly and succinctly stated in the special Report by the Health Officer of the town. There is ample evidence also that the general sanitary administration is being conducted on sound principles; that local causes of disease are being searched out and remedied, and that much has been and is being done towards carrying out those great works of improvement, especially as regards drainage and water-supply, which are so important for the general health of the inhabitants of this great city, in which it appears, according to the new census, the population was roughly estimated at 820,000. This census was taken on the 26th February 1891, and full particulars regarding the results obtained by it may be looked for in the Report for the year immediately following that with which we are now concerned. In some few places even in this Report calculations are based on the Census of 1891, but as a whole the figures of the Census of 1881 continued to be followed as the ground work for the health statistics of 1890.

2. *Births.*—According to the Census of 1881, the population amounted to 773,196, of which 464,763 were males and 308,433 females. What the proportion between the sexes is, according to the new census, forms one of the interesting questions to be considered when the particulars of that census have been furnished, but is not probable that any marked change has taken place in this respect. It is upon the rough estimate of the new census that the Health Officer has deduced the general birth-rate of 19·21 for 1890. In all, excluding still-births, 15,568 births were registered during the year. According to sex these were in proportion of 104·76 males to 100 females. According to class, on the figures of the 1881 Census, the Eurasians show the higest ratio, 68·49; the Jews next, 43·96; and then various other classes, until the minimum of 10·64 among Brahmins is reached. Without details of the proportion of males and females in each class these birth-rates are not of much value. If the results be considered according to locality the extremes are even more strongly marked, for omitting the Water Division, in which only one birth was registered among a population of 24,887, the birth-rate ranged between 7·11 in one section of the town and 45·15 in another. It would be interesting in future reports to know more clearly what are the circumstances which seem to govern these very different results.

3. *Deaths by Class and Sex.*—The total deaths numbered 20,534, or the equivalent of 25·35 per 1,000 of the population, as shown by the approximate census returns of 1891. In only three of the previous 13 years with which comparison is made was the actual number of deaths fewer than in 1890, and in each of these three the difference is very slightly in their favour. On the other hand, many of these years show a considerable excess over 1890, and in some of them the excess is marked, especially in 1877, when the total stood at 33,511. In 1889 the higher mortality represented by 23.378 deaths was attributed to an influx of strangers, who were driven into the town by distress consequent on failure of the harvest; and the same cause no doubt operated more largely in 1877. In 1890 the number of deaths among strangers in Bombay was much less than it had been in 1889. Among different classes, taken as totalled in 1881, there is a marked difference in the death-rates—between 18·56 among Europeans, 19·31 among Native Christians, 21·11 among Parsees, 31·75 among low-class Hindus, 32·98 among Mussulmans, and 49·48 among Jains. It is very satisfactory to find, on a comparison of the death rates among Europeans and Parsees, regarding which figures are given for 19 years, that in both classes there has been a marked and for the most part steady decline in these rates. Among Parsees the figures varied during the first nine of these years between 20 and 28, in the last 10 between 20 and 22. Among Europeans, in the same way, the range between 24 and 32 has fallen to a range between 18 and 22. According to sex the deaths among males equalled 23·40, and among females 31·30. This great preponderance of female deaths is not explained.

4. *Deaths according to Age.*—It is worthy of notice that the mortality among infants in Bombay does not amount to half of what it was in the town of Madras. Under one year the death-rates given during 1890 are, for males 289·16, and for females 236·61, or for the two taken together 262·45. Considering the preponderance of female mortality as a whole, which has been already referred to, it

is remarkable that the statistics regarding the first year of life should show such an opposite result. The complete table which is contained in paragraph 17 of the Report contains some other anomalies in the sex ratios at different ages which are deserving of more explanation, but as these ratios are calculated on the population figures of 1881 the results of the new census may be awaited. The death-rates among male and female children taken together were as follows:—

Under 1 year	262·45
1 and under 2 years	100·48
2 „ 3 „	44·50
3 „ 4 „	21·92
4 „ 5 „	13·44
Under 5	105·97

4. *Deaths according to Causes.*—The causes to which the deaths were ascribed were as follows, the ratios, it is to be observed, being the product of calculations drawn on the Census of 1891:—

Diseases.	Number of Deaths.	Ratio per 1,000 of Population.
Small-pox	150	·18
Measles	179	·22
Fever	6,489	8·01
Cholera	102	·12
Phthisis	2,728	3·37
Diseases of the nervous system	1,936	2·39
„ „ respiratory system	3,335	4·12
Diarrhœa	905	1·12
Dysentery	507	·63
Accidents	397	·49
All other causes except still-born	3,806	4·70
Total	20,534	25·35

The Health Officer remarks that small-pox, measles, cholera, respiratory diseases, diarrhœa, and dysentery had decreased, whereas there had been an increase of fevers, phthisis, nervous diseases, and accidents.

6. *Deaths according to Locality.*—As usual, the distribution of the deaths according to locality was very unequal. With an average of 25·35 deaths per 1,000 in the town of Bombay as a whole, there was a maximum of 52·58 in the Parel section; the second highest rate (47·48) in second Nagpada section; the third highest (40·75) in the Byculla section. Omitting the Water Division and the southern fort, where the population is small, the minimum mortality (9·93) is returned by the Esplanade section. It may appear too trifling a matter for notice, but the want of uniform spelling of the names of the various sections of the town is very apt to lead to confusion. In the statement given at page 367 of the Report, many of the sections have their names very differently spelt from that adopted in the table at page 548, which, in other respects, appears to be merely a duplicate of this statement. For example "Oomarkhari," "Fanaswadi," and "Kumbharwada," appear in the statement, whereas the same places as indicated by the population and number of deaths are entered in the table as "Oomberkhari," "Phunuswaree," and "Koombharwara."

7. *Local Sanitary Defects.*—What are the local causes to account for the excessive mortality in certain parts of the town? The Health Officer describes them. He says, that in the three districts which suffered most, Parel, second Nagpada and Byculla, "we have conditions that lead to common results, impurity of the soil and air, foulness from imperfect drainage and absence of drainage." In these districts there is "a great excess of mortality, which should not and need not be. In Parel, "and Byculla nuisances from pools of sewage, where there are no drains or where there are drains and "no connections made, which poison the air and soil and offend the senses—pollutions amidst "dwellings and around the district, pools of sewage polluting ground and air and oozing to lowest "levels." Lamentable as the state of things is, he continues that it is more or less the condition of all the suburbs. The Colaba causeway "has no drains, and all the drainage and all the water brought in pipes has to flow into cesspools to pollute the ground." Near the Chinchpoolgy station there is a ditch of sewage "festering and corrupting." "By the side of the Tulsi water-pipe there is a pond of sewage from a mill. To the east horrible collections and pools of sewage." The evil influence of the insanitary conditions present in three worst districts is manifest. In each of them the mortality from diarrhœa was about double that of the city generally, and there was also great excess of fever deaths, which in Parel was especially marked, and reached here the high ratio of 20·85 per 1,000. Even in the best parts there are serious evils which still have to be dealt with. On Malabar Hill, where the population has much increased, cesspools abound, and the nuisance and danger thus arising can only be removed by the construction of drains.

8. *History of Chief Diseases. Cholera.*—In common with the Bombay Presidency the city of Bombay suffered little from cholera during 1890. Only 102 deaths were reported from this cause. The disease was more prevalent in January, February, and July than in any other part of the year. As has been observed in other years natives of the city suffered much less than those born elsewhere. Of the 134 persons attacked, 110 had come from other places, and of these again 47 had arrived within six months of their seizure. In Girgaum the highest mortality from cholera occurred. The Health Officer hopes for a reduction of the disease in this quarter in future years, "as there has been through

" drainage and sanitary work, a reduction of mortality in localised portions of the district where " cholera was once endemic. In Girgaum, as in the other portions of the city where buildings have " been improved and more opulent classes attracted, and cesspools removed and drains constructed, " fewer cases of cholera occur. In *wadies*, where once epidemics were expected every year, and " preparations made for them, cases seldom now occur, and when they occur others do not follow." This testimony is very valuable evidence in support of what we have so frequently and strongly insisted on, that the only proper and efficient means of diminishing cholera lies in the improvement of the sanitary condition of localities.

9. *Small-pox and Vaccination.*—Small-pox also was decidedly in abeyance during the year, only 150 deaths were registered under this head. Of the 33 sections of the city, small-pox deaths occurred in 28, but in most of them the number was confined to a few. In only five of them did the number exceed 10. The maximum was 19 in Parel. The vaccination staff were active, and the return of their work may be thus summarised:—

Number of primary vaccine operations	19,722
Number successful	18,473
Number of operations on children under one year	15,759
Number successful	15,080
Number of re-vaccinnations	1,772
Number successful	409

The number of infants successfully operated on (50,080) is very large. The total births in Bombay during 1890 aggregated 15,568, and making allowance for deaths among them in the very early months, the only way in which the great number of infants protected can be explained would seem to be that, as in Madras, many of them belonged to the large population of the city who do not reside permanently in the place. No ratios are given in the vaccination statistics. They would be very useful in comparing the results of one year with another.

10. *Fevers.*—The only other diseases we need specially notice are those which come under the great head of Fevers. In spite of an epidemic of influenza the total deaths so registered, we are told, was " 777 less than in the year before"; while at the same time it is stated that "the mortality from fevers is equal to 8·01 against 7·99 last year," a discrepancy we are unable to reconcile. It is all the more difficult to reconcile, because we observe that the ratio 8·01 for 1890 is based on the increased population of 1891. The deaths due to fevers were very unequally distributed. In Parel, as already mentioned, they equalled 20·85 per 1,000, attributable in part to insanitary conditions from bad drainage, and also in part it appears to increase of population over the Census of 1881, which is not allowed for in the figures on which the sectional rates are calculated. No other section approaches Parel in fever mortality, the nearest to it being 12·15 in Byculla. It is mentioned that an epidemic of influenza occurred during the year; that it exercised an influence on the mortality, "increasing the deaths in March to the unusual number of 994." In the week ending 11th March the deaths rose to the rate of 38·45 per 1,000 per annum. This seemingly must have been due in great measure to the influenza, but we can find no details to indicate the time of its first appearance, of its rise, or of its fall, or of its distribution over the city. It was the most remarkable event in the whole sanitary history of the year, and many most interesting and valuable particulars might have been collected regarding it.

11. *Sanitary Work.*—A good idea of the enormous amount of work done by the Health Department in Bombay during 1890 may be formed from the following figures, which are extracted from Dr. Weir's report:—

Income of Health Department	Rs. 634,478
Expenditure	„ 1,155,118
Cost to municipality	„ 520,639
Daily average number of men and women employed	4,129
Daily average number of carts employed	788
Number of notices issued	3,327
Ditto summonses issued	3,290
Daily average weight of garbage collected	Tons 847
Ditto ditto night-soil ditto	„ 361

We presume that this last item refers to the amount of night-soil removed under the *halacore* system, which must always remain a very heavy charge on the municipality until provided for by sewers. Mr. Baldwin Latham's Report on the Sanitation of Bombay, to which reference was made in our memorandum on the Bombay Administration Report for 1889–90, had been considered by a special committee appointed for this purpose under the orders of the Government. The most important recommendation he made was that the main sewer outfall should be at Colaba, but the conclusion arrived at by the Committee is that this is practically impossible, and the decision of the Government has coincided in their opinion. In the great work of completing a good water-supply further important progress was made during the year. The dam at Tansa was practically completed, and the laying of the main was proceeding. This dam contains 11,000,000 cubic feet of masonry, and the estimates of the whole scheme amount to Rs. 14,850,000.

19th July 1892.

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REPORT

ON

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IN

1891-92.

VOL. XXV.

Presented to both Houses of Parliament by Command of Her Majesty.

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REPORT.

I.—EUROPEAN ARMY.

THE present Report on Sanitary Measures in India during the year 1891 is prepared for presentation to Parliament. It contains chapters on the health of the European and Native Troops, on the health of prisoners in jails, and on the health of the general population; it also contains chapters on vaccination, on medical institutions, including medical schools and lunatic asylums, and a chapter on sanitary works. Appended to the Report are abstracts of reports by the three principal Sanitary Commissioners in India, and memoranda by the Army Sanitary Commission in England reviewing the several Sanitary Reports for India.

Sickness and mortality in 1891.

There was less sickness among the European troops on service in India during 1891 than in the previous year, but the mortality was greater. Of an average strength of 67,030, the admissions into hospital were in the ratio of 1,379 per 1,000 against 1,520 in 1890, the daily sick-rate was 79, or 8 per 1,000 less, and the death-rate was 15·89 against 13·84. The loss by invaliding was 27 per 1,000, or 2 per 1,000 more than in 1890, bringing the total loss by death and invaliding up to 43 per 1,000, an increase of 4 per 1,000 on the previous year.

The following statement shows the relative extent of sickness and mortality among European troops in the three Presidencies during 1891 and the previous year:—

Presidency.	Average Strength.	Ratio per 1,000 of Average Strength.				
		Admissions.	Daily Sick.	Deaths.	Invaliding.	Total loss.
Bengal - - - { 1891	40,994	1,394	80	16·86	25	42
Bengal - - - { 1890	41,353	1,584	89	15·50	25	41
Madras - { 1891	13,324	1,304	82	14·49	31	46
Madras - { 1890	13,707	1,442	91	12·84	23	36
Bombay - - { 1891	12,713	1,409	73	14·24	29	43
Bombay - - { 1890	12,763	1,396	77	9·56	29	38
INDIA - - { 1891	67,030	1,379	79	15·89	27	43
INDIA - - { 1890	67,823	1,520	87	13·84	25	39

It will be seen from the above statement that of the three armies Bengal was again the most unhealthy. The chief causes of sickness in the whole European Army were, as in the previous year, venereal diseases and ague, the former yielding a ratio of 401 per 1,000 against 504 in 1890, and the latter 343 per 1,000 against 354. More than half (54 per cent.) of the total sickness resulted from these two causes. Influenza was present among the troops to a very small extent, and caused an admission rate of only 5·5 per 1,000 against 33·4 in 1890. Enteric fever, as usual, was the chief cause of mortality, and the death-rate from it rose from 4·91 to 5·73 per 1,000. Cholera also was much more prevalent, there being 252 admissions in 1891 against 58 in 1890, and 168 deaths, equal to 2·51 per 1,000, against 49 or 0·72. Of the total deaths, enteric fever caused 36 per cent., and cholera. 16 per cent.

Bengal Army.

In the Bengal Army the admission-rate fell from 1,584 per 1,000 in 1890 to 1,394, the daily sick-rate from 89 to 80 per 1,000, but the death-rate rose from 15·50 to 16·86. Venereal diseases and ague were the chief causes of admission to hospital, contributing 28 and 26 per cent. respectively of the total sickness. The chief cause of mortality was enteric fever, with a ratio of 6·64 per 1,000 against 6·26 in 1890. Under this one head alone 40 per cent. of the total deaths occurred. Cholera mortality among the Bengal troops was higher than it had been since 1881; the deaths increased from 41 or 0·99 in 1890 to 114 or 2·78 in 1891.

Madras Army.

Though there was less sickness in the European army of Madras in 1891 than in the previous year, both the admission and constantly-sick rates showing a decrease, the mortality rose from 12·84 per 1,000 to 14·49. As in Bengal and Bombay venereal diseases and ague caused the majority of the admissions, the former yielding 31 per cent. of the total admissions, and the latter 19 per cent. Among the death causes enteric fever was the chief, contributing 21 per cent. of the total deaths against 28 per cent. in 1890, cholera followed with 11 per cent.

Bombay Army.

In the Bombay Army also all the ratios, with the exception of the constantly-sick rate, were higher than in 1890, the death-rate (14·24 per 1,000) being 4·68 per 1,000 in excess. Chief among the diseases causing admissions were venereal diseases and ague, together yielding 56 per cent. of the total. Of the deaths 39 per cent. resulted from enteric fever, and 18 per cent. from cholera.

Groups of stations.

As regards the groups of stations, the old geographical system has, by order of the Government of India, been discarded in favour of a new set arranged by a committee. The new groups, numbering 12, are, the Sanitary Commissioner (Dr. Rice) reports, to be adhered to by both the medical and the meteorological departments, and are to be used equally for the statistics of European and of Native troops and of prisoners. It will be seen, however, that the groups of the European and of the Native Armies differ slightly in that, as there are no European troops in Assam, the Hill Convalescent Depôts have been separated from the Hill stations, and made a distinct group.

The following table shows the sickness and mortality among the European troops in the new groups:—

Groups.	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admission Rate.	Constantly Sick Rate.	Death Rate.
Burma Coast and Bay Islands	1,624	1,277	83·7	14·16
Burma, Inland	2,711	1,781	100·0	18·07
Bengal and Orissa	2,207	1,885	99·7	16·76
Gangetic Plain and Chutia-Nagpur	6,714	1,563	98·7	24·43
Upper Sub-Himalayan	12,711	1,477	86·7	18·72
Indus Valley and North-Western Rajputana	4,627	1,360	71·8	11·67
South-Eastern Rajputana, Central India, and Gujarat	5,868	1,412	78·2	18·06
Deccan	9,490	1,231	75·7	11·70
Western Coast	1,304	1,626	85·9	5·37
Southern India	3,579	1,287	87·5	14·25
Hill Stations	9,082	1,157	65·8	11·67
Hill Convalescent Depôts	2,577	1,307	81·9	17·46

Of the above 12 groups, eight returned a higher constantly-sick rate than that of the European Army as a whole, the highest being 100·0 per 1,000 of average strength in the Burma Inland group. Bengal and Orissa followed with 99·7, and Gangetic Plain and Chutia-Nagpur with 98·7. The lowest ratio (65·8) was returned by the Hill Stations group. The death-rate of the entire Army was exceeded by six groups, the Gangetic Plain and Chutia-Nagpur returning the highest (24·23), followed by Upper Sub-Himalayan group (18·72); that of the Western Coast (5·37) was the lowest.

Of the stations with a strength of over 1,000, seven returned a higher death-rate than that of their Presidencies, viz., Allahabad 43·95, Rawalpindi 24·74, Lucknow 22·87, Bareilly 22·12, Peshawar 20·76, Meerut 19·17, and Poona 15·27.

Cholera.

The year was one of heavy mortality from cholera, and the disease affected the European troops much more severely than in 1890. The admissions to hospital from cholera numbered 252 or 3·8 per 1,000 of average strength, against 58 or 0·9 per 1,000, and the deaths 168 or 2·51 per 1,000 against 49 or 0·72 in 1890. Among the troops in the Bengal Army the mortality from cholera was higher than it had been since 1881. In 1891 there were 170 cases of the disease with 114 deaths, the latter being in the ratio of 2·78 per 1,000 of strength against 41 deaths or 0·99 in 1890. The Madras Army recorded 29 cases of cholera, of which 21 proved fatal, the deaths being in the ratio of 1·58 per 1,000. In the previous year there was only 1 case, which terminated fatally. In the Bombay Army the cases of cholera rose from 7 to 53, and the deaths from 7 or 0·55 per 1,000 to 33 or 2·60.

Among the whole of the European troops in India there were during the year under notice only 14 cases of small-pox, of which only one, in the Bengal army, was fatal, as compared with 36 cases and 4 deaths in 1890. Small-pox.

From intermittent fever the admissions to hospital among the European troops in 1891 were in the ratio of 343 per 1,000 of strength against 354 in the previous year. The deaths under this head numbered 12, an increase of two on the mortality of 1890. Of these 7 occurred among the Bengal troops, and 5 among the Madras troops. Fevers.

From enteric fever the admissions rose from 1,253 or 18·5 per 1,000 of strength to 1,366 or 20·4, and the deaths from 333 or 4·91 per 1,000 to 384 or 5·73. Of the three Armies, Madras was the only case in which the mortality under this head was lower than in 1890, while Bombay showed a considerable increase. The Bengal Army recorded an enteric fever death-rate of 6·64 per 1,000 against 6·26 in 1890, the Madras Army 3·08 against 3·65, and the Bombay Army 5·58 against 1·88. As usual, young and unacclimatised soldiers were the chief sufferers, those under 25 years of age yielding a death-rate of 9·11 per 1,000 against 7·78 in 1890, while among men between 25 and 29, and from 30 to 34, the mortality was 2·97 and 0·71 per 1,000 respectively. Among men of less than two years' residence in India the death-rate from this cause rose from 10·21 to 11·60 per 1,000, among men of three to five years from 2·98 to 3·64, and among troops of from six to ten years from 2·17 to 2·23. Enteric fever again formed the subject of investigation on the part of medical officers, but no satisfactory results were obtained as to the origin of outbreaks. Some interesting remarks regarding the opinions of bacteriologists on the diagnosis of this disease will be found in the abstract of Dr. Rice's report, pp. 47 and 48. He observes that the whole investigation is a very difficult one, and in it no amount of enthusiasm will compensate for lack of training and apparatus. "What is wanted in India is not more private work by medical officers, "however enthusiastic, but work by trained experts in properly equipped laboratories "to supplement the clinical work of medical officers." Steps have now been taken with a view to the establishment of bacteriological laboratories in India.

The admissions from dysentery and diarrhœa among the European troops were in the ratio of 60 per 1,000 of strength or 1 per 1,000 more than in 1890, and the death-rate 0·52 against 0·78. As in the previous year, there were no deaths from diarrhœa in the Madras Army, but dysentery was more prevalent than in either the Bengal or Bombay Armies. Bowel complaints.

Venereal diseases, although not so prevalent as in 1890, continued to stand first in the list of causes of admission to hospital and of invaliding. They were the cause of 29 per cent. of the admissions during 1891, and 15 per cent. of the invaliding of the European Army of India. The ratio of admissions from venereal diseases per 1,000 of strength was 401, or 103 below that of 1890. The decrease was participated in by all three armies. In Bengal the admission-rate fell from 504 to 395 per 1,000, in Madras from 491 to 402, and in Bombay from 515 to 417. The reduction of the admission-rate of over 100 per 1,000 was partly attributed by some medical officers to the opening of new cantonment hospitals. "The "returns from many of the new cantonment hospitals themselves," Dr. Rice says, "are still wanting. Most of those that have been received do not show large "attendances of either venereal or other patients; but it is not so important that "large numbers should be treated as that the real spreaders of disease should come "under treatment. *One* diseased woman, if visited by many men, may work great "havoc in a station. Again, low admissions among women may mean either absence "of disease or failure to take advantage of the hospitals." Venereal diseases.

The loss to the whole army by invaliding during 1889 amounted to 1,793 men, equal to 26·78 per 1,000, against 1,715 or 25·29 in 1890. The proportion of invalids to strength was least in Bengal (24·64 per 1,000) and highest in Madras (31·28), that of Bombay being 28·98. Of the total number invalided 34 per cent. were discharged as unfit for further service, just 1 per cent. less than in 1890. As regards the influence of age and length of residence in India upon invaliding, 54·01 per cent. of the number were under 25 years of age against 53·04 in 1890, while 30 per cent. of the total number invalided were of less than two years' service, and 77 per cent. were of less than five years' service. In the European Army as a whole 80 per cent. of the total strength had seen less than five years' service, and 51 per cent. were under 25 years of age. Invaliding.

II.—NATIVE ARMY.

Sickness and mortality in 1891.

The health of the Native Army of India during 1891 was, on the whole, more satisfactory than in the previous year, though the death-rate, on account of the prevalence of cholera, remained high.

The ratios of sickness and mortality of each section of the Native Army of India for 1891 and the previous year are given in the following table :—

		Average Strength.	Ratio per 1,000 of Average Strength.			
			Admissions.	Daily Sick.	Deaths.	Total Deaths, including Absentees.
Bengal Native Army	1891	66,230	1,021	35	17·32	18·10
	1890	64,080	1,306	42	19·16	21·82
Madras ditto	1891	26,088	1,017	46	20·05	27·28
	1890	26,032	924	41	15·63	20·64
Bombay ditto	1891	23,780	978	31	9·63	12·34
	1890	24,032	1,139	35	10·99	12·92
Corps of Central India and Rajputana	1891	5,175	629	20	7·73	8·96
	1890	5,118	702	21	9·96	9·96
Hyderabad Contingent	1891	7,063	529	9	6·09	7·83
	1890	7,071	553	17	4·81	6·71
India	1891	128,600	972	35	15·44	19·34
	1890	127,746	1,137	39	15·91	18·64

As usual the Hyderabad Contingent and the Central India Irregular Force were the healthiest branches of the Native Army. The Madras Army returned the highest sick and death-rates, due to some extent to the unhealthiness of troops serving in Burma.

The chief cause of sickness in the Native Army was ague, which yielded 44 per cent. of the total admissions. Among the diseases from which the admissions to hospital were higher than in 1890 were cholera and bowel complaints; while from influenza, small-pox, all fevers except enteric, and pneumonia, there was a decrease in the admissions. Cholera and pneumonia were the chief causes of death in the Native Army, the ratios being 2·64 and 2·59 per 1,000 respectively of average strength against 1·83 and 3·96 in 1890. Under these two heads, 33 per cent. of the total deaths were registered. Fevers of all kinds were the cause of 20 per cent. of the total deaths, against 40 per cent. among the European troops. From ague, remittent and simple continued fevers, the deaths among the Native troops were in the ratio of 2·89 per 1,000, while among the European troops the proportion was only 0·60. On the other hand the death-rate from enteric fever among the Native troops was only 0·13 per 1,000 as compared with 5·76 among the European troops, and 0·08 among prisoners in jail. Native troops seem to be more liable to dysentery than European troops, for while among the former this disease caused 5·6 per cent. of the total deaths, among the latter it was the cause of only 2·8 per cent. of the deaths. But of all diseases those of the respiratory organs are the chief causes of death in the Native Army. From pneumonia the mortality of Native soldiers (326 or 2·53 per 1,000), was nearly five times as great as that of European troops (36 or 0·54 per 1,000).

Bengal Native Army.

The health of the Native Army of Bengal in 1891 was much better than in 1890. There was considerably less sickness, and the death-rate fell from 19·16 per 1,000 to 17·32. Ague, though less prevalent than in 1890, caused 43 per cent. of the total admissions. Cholera and pneumonia were the chief causes of death, the former yielding over 21 per cent. of the total deaths, and the latter 19 per cent.; the cholera death-rate was 3·73 against 3·28 in 1890.

The following statement gives the principal statistics of the Native Army, arranged in geographical groups, for 1891 :— Groups stations.

	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admissions.	Daily Sick.	Deaths.
Burma Coast and Bay Islands	2,111	992	57	20·37
Burma, Inland	8,261	1,990	88	40·79
Assam	2,157	1,890	77	24·57
Bengal and Orissa	3,125	1,322	54	16·32
Gangetic Plain and Chutia-Nagpur	7,079	803	31	8·90
Upper Sub-Himalayan	14,097	771	30	11·92
Indus Valley and North-Western Rajputana	15,298	1,141	36	14·64
South-Eastern Rajputana, Central India, and Gujarat	14,027	749	24	7·13
Deccan	20,265	735	27	7·65
Western Coast	3,731	624	23	7·77
Southern India	7,742	538	26	7·62
Hill Stations	12,808	1,428	47	17·80

In six of the above groups the daily sick-rate was in excess of the ratio for the whole Native Army; and in five groups the death-rate was higher. The high mortality of the Burma Inland group (40·79) was partly due to cholera, dysentery and diarrhœa and ague, the death-rates from which were 2·42, 8·96, and 8·72 per 1,000, all being considerably higher than those of any other group.

Corps of Central India and Rajputana.

The health of the corps of Central India and Rajputana (average strength 5,175) was also better than in the previous year. The admission-rate fell from 702 to 629 per 1,000, and the death-rate from 9·96 to 8·96. Ague was the cause of 36 per cent. of the total sickness. Pneumonia and remittent fevers were the principal death causes, the former having accounted for 35 per cent. of the total mortality and the latter 20 per cent.

Hyderabad Contingent.

The health of the troops composing the Hyderabad Contingent was not so good as in 1890. Of an average strength of 7,063, the admissions to hospital were equal to 529 per 1,000 of strength against 553, and the death-rate was 6·09 against 4·81. Ague was the chief cause of sickness, yielding 34 per cent. of the total sickness; and cholera and pneumonia were the principal causes of mortality, yielding 19 and 16 per cent. respectively of the total deaths. In the previous year there was no cholera among these troops.

Madras Native Army.

The health returns of the Madras Native Army were again materially affected by the inclusion of the statistics of troops on service in Burma. The ratio of admissions to hospital per 1,000 of an average strength of 26,088 was 1,017 against 924 in 1890, the daily sick-rate was 46 or 5 per 1,000 more, and the death-rate rose from 15·63 to 20·05 per 1,000. Ague caused 46 per cent. of the total sickness. From cholera there were 52 deaths, equal to 1·99 per 1,000, against 14 or 0·54 in 1890. Ague caused 18 per cent. of the total deaths, cholera 10 per cent., and remittent fever and pneumonia each nearly 8 per cent. Of the Native troops on service in Burma during 1891, the Madras Army furnished 83 per cent. Among this portion the admissions into hospital were in the ratio of 1,676 per 1,000, the constantly sick-rate 76, and the death-rate 36·31.

Bombay Native Army.

There was a marked improvement in the health of the Bombay Native Army in 1891. Of an average strength of 23,780 the admissions to hospital were in the ratio of 978 per 1,000 against 1,139 in 1890, the daily sick-rate was 31 or 4 per 1,000 less, and the death-rate 9·63 against 10·99. Ague caused 46 per cent. of the total sickness. Pneumonia was the chief cause of mortality, contributing 18 per cent. of the total deaths, and cholera and remittent fever each over 13 per cent.

III.—GENERAL POPULATION.

Vital statistics.

Births were registered throughout all the 10 provinces of India in 1891 excepting Bengal, where the system of limited registration still remained in force, and was confined to 141 of the total 145 municipal towns. The provincial birth-rates varied between 20·31 and 43·09 per 1,000 of population under registration. The best results were obtained in Berar and in the Central Provinces, their respective birth-rates being 43·09 and 42·8; Bombay came next with 36·27, the Punjab 34·02, and the North-Western Provinces and Oudh 33·26. In all provinces except Bengal, Assam, and Coorg, the birth-rate exceeded the death-rate. The year was more unhealthy than 1890, and the registered deaths rose from 5,848,122 to 5,885,539, but owing to the ratios of mortality of nearly all the provinces being calculated on the census population of 1891, the average death-rate declined from 30·14 to 28·42. Of the chief diseases, cholera was very prevalent, and the total number of deaths from it were 582,430, being the highest figures recorded in any year since 1877, and an increase of 291,228 on the deaths from the disease in 1890. Every province contributed to the increase, but especially Bengal, the North-Western Provinces and Oudh, and Madras. In Bengal and Assam the number of cholera deaths was the greatest on record. There was an increase also in the deaths from dysentery and diarrhœa. On the other hand, the mortality from small-pox and fevers showed a noticeable decrease, which however was not general, as under each heading several provinces registered a greater number of deaths than in 1890.

The deaths from the chief diseases and from all causes in the several provinces were as follows:—

	Cholera.		Small-pox.		Fevers.		Dysentery and Diarrhœa.		Deaths from all Causes.		
	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000 of Population under registration.	
										1891.	1890.
Bengal, excluding Calcutta	229,575	3·26	16,193	0·23	1,333,395	18·94	43,153	0·61	1,896,261	26·94	21·48
Calcutta	1,553	3·32	13	0·02	4,675	10·02	1,433	3·07	13,033	27·94	27·93
North-Western Provinces and Oudh	169,013	3·60	26,355	0·56	1,033,059	22·02	49,586	1·06	1,460,732	31·14	37·27
Punjab	10,107	0·49	3,426	0·17	442,254	21·52	12,152	0·59	598,789	29·13	46·87
Lower Burma	2,400	0·52	1,326	0·29	35,658	7·76	4,162	0·91	73,190	15·93	17·40
Central Provinces	21,312	2·42	748	0·08	190,550	21·61	20,889	2·37	313,364	35·54	33·52
Coorg	7	0·04	476	2·75	2,703	15·61	172	0·99	3,771	21·79	25·32
Assam	23,882	4·76	2,3[illegible]	0·47	75,965	15·13	14,418	2·87	150,156	29·91	29·64
Madras	98,773	3·5	41,322	1·4	247,029	8·6	34,223	1·2	747,553	26·2	22·80
Bombay	17,850	0·95	1,491	0·08	368,913	19·60	37,728	2·00	513,132	27·26	28·18
Berar	7,958	2·8	34	0·01	49,850	17·5	22,007	7·7	115,558	40·6	35·49
Total	582,430	2·81	93,745	0·45	3,784,051	18·27	239,953	1·15	5,885,539	28·42	30·14

Bengal.

Registration of births and deaths in Begal during 1891 was again very indifferently performed. Since the close of the year important steps have been taken in the matter. Municipalities have been relieved of the work of recording vital statistics, and the town police entrusted with the duties. In 1891 the registration of births was limited to 141 towns whose average birth-rate was only 21·46 per 1,000 of their population, which was made up of town ratios ranging from 44·57 to 2·95. Birth registration has also from the 1st January 1892 been reintroduced in rural areas, and it is expected that in future the results will be more accurate.

The year was exceptionally unhealthy. The rainfall was deficient by nearly 16 inches, and the out-turn of crops was below the average in 36 of the 44 districts, giving rise to higher prices of food grains. But the chief cause of the exceptional sickness of the year was the Ardhodoya Jog fair, where cholera was prevalent. The total registered deaths amounted to 1,896,261 or 26·94 per 1,000, based on the census of 1891, against 1,612,479 or 24·48, calculated on the census figures of 1881. Compared with other large provinces of India, the death-rate of Bengal was below

that of any excepting Madras. "This circumstance, I think," Dr. Gregg, the Sanitary Commissioner, says, "shows how imperfect the registration of vital statistics must still "be in Bengal, where I estimate the death-rate is not less than 34 per 1,000 of the "population, for there is no doubt that Bengal is as unhealthy, if not more so, than "any other province in India." Only seven of the 44 districts in the province enjoyed better health than in 1890.

Of the chief diseases, cholera prevailed with great severity. The death-rate from it was the highest on record except that of 1876. No less than 229,575 persons died from the disease in 1891, equal to 3·26 per 1,000 of population, against 145,885, or 2·07 in 1890. Every district was affected, and nearly all recorded an increased mortality as compared with the previous year. Purnea, Jalpaiguri, Nadia, Rangpur, and Shahabad were the chief sufferers, recording cholera death-rates of 11·08, 9·93, 9·36, 8·35, and 6·95 respectively. The excessive mortality from this disease was attributed by Dr. Gregg to the Ardhodoya Jog bathing festival in Nadia and the scanty rainfall of the year. The festival occurs only once in 27 or 28 years, and the gathering on this occasion was unusually great owing to the belief that it was to be the last that would be held on the banks of the Ganges. Thousands of pilgrims arrived in an exhausted condition to suffer more privations and hardships among the enormous crowds already assembled; cholera broke out amongst them, and many died at the places where they congregated on the river, and others on their way to or at their homes. In this way the epidemic is supposed to have been introduced into most of the localities through which the pilgrims passed and communicated to the non-pilgrim population. But the Army Sanitary Commission do not consider the evidence on which this opinion is based warrants the conclusion. They, however, think it important in unhealthy seasons to discourage fairs as far as possible; but "the proper 'remedy," they observe, "is to regulate the sanitary conditions at the places where "the fairs are held, and to protect towns and villages alike by improvements in "water-supply, drainage, and all other sanitary requisites." A set of rules for the better sanitary regulation of fairs was being considered by the Government of Bengal.

The mortality from small-pox was in excess of any year since 1884. The deaths numbered 16,193 per 1,000 or 0·23 against 12,619 or 0·17 in 1890. The districts of Cuttack, Midnapore, Puri, and Lohardaga suffered most, which, in Dr. Gregg's opinion, was due to the insufficiency of vaccination establishments. For instance, Midnapore town, with a population of about 33,000 people, is reported to have entertained only one vaccinator. Nearly two-thirds of the deaths from small-pox occurred among children under 12 years of age. As regards the mortality in towns, Dr. Gregg reports: "The "usual excuse is offered in most cases, viz., that the disease was introduced from "without, and did not originate in the towns themselves; but, as I pointed out in "last year's report, this does not exonerate the local authorities from blame, because "if their towns had been thoroughly protected by vaccination, small-pox, when "imported, would not have created much havoc, and could easily have been stamped "out." The Vaccination Department has since been re-organised, and greater efficiency in vaccination work is expected.

Under fevers 1,333,395 deaths were registered, representing a ratio of 18·94 per 1,000, or nearly three-fourths of the entire death-rate of the province. "No doubt," Dr. Gregg writes, "some inflammatory and other diseases, such as pneumonia, "influenza, and the like, are occasionally recorded under this head, but in the main "malarial poison is the cause of the high death-rate of the fever mortality returned." In the previous year (1890) the high rate of fever mortality (1,155,569, or 16·42 per 1,000) was said to have been induced by excessive rainfall, and the still higher death-rate of the year under notice, Dr. Gregg states, must be attributed principally to deficient rainfall. His reasons for this conclusion, in the opinion of the Government of India and of the Army Sanitary Commission, are not convincing, "and it would rather "seem," the Commission say, "as if, over and above the meteorological conditions of "excessive or deficient rain, there was some other unknown factor at work deter-"mining the results. . . . . We have failed to discover in the statistics "adduced any direct relation between the extent of the fever mortality and the "deficiency of rain." Dr. Gregg was also of opinion that a lower standard of living owing to the failure of crops and high prices of food had much to do with the febrile unhealthiness of the year. Six out of the 44 districts recorded fever death-rates of over 30 per 1,000, 10 others over 20 per 1,000, and the remaining 28 districts above 10 per 1,000, except Saran (10·00) and Puri (4·98).

Under dysentery and diarrhœa there were 43,183 deaths registered, equal to a ratio of 0·61 per 1,000, a mortality almost identical with that of 1890.

The health of the town of Calcutta during 1891 was less satisfactory than in any previous year except 1884. The registered deaths rose from 12,382 in 1890 to 13,033, which gives a ratio of 27·94, based on the Census of 1891. All the chief diseases contributed to the increase, except small-pox, from which the mortality declined from 700 to 13. From cholera the deaths rose from 963 to 1,553, the excess being attributed partly to an outbreak of the disease at the Ardodhoya Jog noticed above. The fever mortality (4.675) was also 1,111 above the mean of the previous 10 years.

North-Western Provinces and Oudh.

The Sanitary Commissioner of the North-Western Provinces and Oudh (Dr. Hutcheson) reports that "the general registration of births and deaths in the "united provinces is undoubtedly effected with considerable accuracy." Owing to the excessive mortality in the spring and autumn months of the previous year there was a decrease of 191,280 in the births registered in 1891, the number having fallen from 1,751,168 in 1890 to 1,559,888. Calculated on the recent Census figures the birth-rate per 1,000 of population was 33·26, which was made up of district rates varying from 18·32 in Dehra Dun to 40·51 in Pilibhit. The births of the year exceeded the deaths by only 99,156. Notwithstanding a very severe epidemic of cholera, the year was a comparatively healthy one. Altogether 1,460,732 deaths, equal to 31·14 per 1,000 of the population, were registered, or 183,295 fewer than in 1890. The district death-rates varied from 47·00 in Sultanpur to 20·31 in Dehra Dun. Of the 49 districts of the province 14 recorded a mortality of over 35·00, while only seven showed a rate under 25·00 per 1,000. Both the urban and rural death-rates were much less than in 1890, and corresponded with the fall in the general death-rate of the province. There was also a decline in the infantile death-rate from 234·5 per 1,000 in 1890 to 204·1, this being the lowest on record. In 20 districts the recorded deaths were in excess of the births.

Cholera prevailed with greater severity than in any year in the last decade except 1887, and the deaths rose from 80,295 in 1890 to 169,013 or 3·60 per 1,000. Every district was affected, and 15 out of the 49 recorded a higher mortality than the provincial rate. The districts with exceptional death-rates from cholera, were Sultanpur 17·59, Partabgarh 13·03, Rae Bareli 10·61, Fyzabad 7·35, and Jaunpur 6·01. The most fatal months were May, June, and July, when 98,386 deaths were recorded. The epidemic sustained its virulence throughout the year, and the disease has since disseminated to a lamentable extent. Several of the towns showed an extraordinary mortality. Among them were Bilgram with a cholera death-rate of 35·44, and Kairana 32·14. As an instance of the efficacy of strict sanitary precautions on the disease, Dr. Hutcheson notices the immunity of the 3rd Gurkhas while passing through the Bhabar during a violent outbreak. It is also noticed that in spite of the great prevalence of cholera during the year the Kumb fair at Hurdwar passed off without any outbreak of the disease either at the fair or after it. This was entirely due to the excellent precautionary sanitary measures initiated. On the other hand the Army Sanitary Commission instance several cases of the relation of sanitary defects to cholera prevalence, and they ask whether more decided and systematic efforts cannot be made to remedy them. It appears, however, that epidemic outbreaks of late years are less frequent, and that when they do occur they are more localized.

Small-pox was considerably less fatal than in 1890, the deaths amounting to 26,355 equal to 0·56 per 1,000 of population, against 55,394. In four districts adjacent to Bengal (Gorakhpur, Azamgarh, Ghazipur, and Ballia) the disease was severe, and in these it is stated inoculation is occasionally practised by operators from that province. In the two first districts vaccination is very backward, only 13·17 and 12·44 per 1,000 of population, respectively, having been successfully vaccinated during the year, which were the lowest ratios recorded in the provinces. The highest town death-rate from the disease was 14·97 at Barhaj, but in 39 other towns, with populations of over 10,000, there were no small-pox deaths. Three-fourths of the total small-pox deaths occurred among children under 12 years of age, a fact which shows the absence of protection by vaccination.

No less than 70 per cent. of the total registered deaths in the province were ascribed to fevers. The number recorded in 1891 was 1,033,059 or 22·02 per 1,000, a decrease of 211,267 on the previous year, which was attributed to the diminished prevalence of epidemic influenza, and the comparative healthiness of the people during the autumn months. It would appear, however, that registration of deaths under this head is very unreliable, as in seven districts the percentage of deaths from fevers to the total deaths varied from 95 to 89 per cent. Among districts the Tarai, as usual,

headed the list with a fever death-rate of 38·82, followed by Fatehpur 31·45, Farukhabad 31·39, Saharanpur 31·15, and Muzaffarnagar 30·44.

Fewer deaths were also registered under dysentery and diarrhœa than in 1890, viz., 49,586 or 1·06 per 1,000 against 53,604. There can be little doubt also of the imperfect registration of deaths from these causes, as four towns returned no deaths, and in several others the "record was obviously absurd."

Punjab.

The general health of the Punjab in 1891 was much more satisfactory than in the previous year, when the deaths exceeded the births by 146,748. In the year under notice the registered births were more numerous than the deaths by 100,453. Owing, however, to the excessive sickness that prevailed in 1890, the number of births registered fell from 736,406 to 699,242. Calculated on the census figures of 1891, the birth-rate of the year was 34·02 per 1,000. The greatest deficiency was observed in the districts of Sialkot, Gujrat, Gurdaspur, and Gujranwala, in which the highest mortality was recorded in the autumn of 1890. The number of deaths registered in the province was 598,789, or 29·13 per 1,000, showing a decrease of 284,360 compared with 1890. By districts the highest death-rate (41·98 per 1,000) was recorded in Delhi, Sialkot coming next with 34·04, followed by Karnal, Gurdaspur, Umballa, and Amritsar, with ratios of over 30 per 1,000. The lowest death-rate (20·24) was recorded by Hazara, and the next lowest (22·73) by the small district of Simla.

Cholera was again epidemic in the province, and was the cause of 10,107 deaths or 0·49 per 1,000 against 3,401 in 1890. The first death was reported from Ding in the Sirsa thana of the Hissar district on the 4th of April, and between that date and the middle of October the epidemic became general, the only districts escaping being Simla, Shahpur, Dera Ismail Khan, Dera Ghazi Khan, and Muzaffargarh. The districts from which the highest cholera death-rates were returned were Peshawar 4·82, and Kohat 3·57 per 1,000. One of the severest outbreaks in the former district occurred in Mattani and several neighbouring villages, in connexion with which the Civil Surgeon reported:—"The probable cause of this increased outbreak was a "fouling of the irrigation channel from which the people of these villages drink." Serious outbreaks of cholera also occurred in the Ludhiana and Lahore districts, their respective death-rates from the disease being 1·54 and 1·47 per 1,000. The rural population suffered much more severely than the urban, the death-rate of the former being 6·73 per 1,000; while in 50 municipal towns in which the disease occurred the mortality was only 1·82. The comparative immunity of the towns is stated to be due to the protection of the wells by the provision of platforms, to which copings are usually attached, whereas in many villages drinking water wells have no such protection, the mouths of the wells being often at a lower level than the ground around them. This want the Lieutenant-Governor believes to be one of the greatest needs in village sanitation, and will, he has no doubt, engage the attention of the Sanitary Board when it comes to consider the Sanitary Bill which was prepared in the previous year. Out of 37,579 towns and villages in the province only 1,039 recorded cholera deaths.

The province enjoyed comparative immunity from small-pox during the year. Only 3,426 deaths were registered from this cause, the death-rate (0·17 per 1,000) being the lowest since the registration of deaths was commenced in 1868. The low rate of mortality was due partly to the work done by the Vaccination Department. The Sanitary Commissioner (Colonel-Surgeon Stephen) reports that "when a weekly report "shows that several deaths from small-pox have been reported from any town or "rural area, the attention of the Civil Surgeon is called to the matter, and vaccinators "are at once sent to the locality, if the outbreaks occur during the vaccinating season, "with instructions to vaccinate as many unprotected persons as possible." At the close of the year, however, the disease became unusually prevalent in several districts, "and the small-pox death-rate," the Sanitary Commissioner states, "will almost "certainly be larger than it was in 1891." This opinion is confirmed in the increase of the deaths from this disease in 1892 to over 11,000.

From fevers 442,254 deaths were reported during the year, representing a death-rate of 21·52 per 1,000 against 692,254 or 33·69 in 1890, the latter being the highest on record. The provincial ratio was made up of district rates ranging from 27·98 per 1,000 in Delhi to 12·80 in Simla. The majority of the deaths registered under this head are reported to have been caused by malarial fevers and their sequelæ, and the Sanitary Commissioner therefore urges that special attention should be directed to measures calculated to put a stop to these causes, namely, the drainage of swamps and water-logged areas. "In the Lieutenant-Governor's opinion," it is stated in the Government Resolution on

the Sanitary Commissioner's report, "in comparison to the benefit to public health "attainable by drainage works, the benefit to be expected from village sanitation "sinks into insignificance, but unfortunately these drainage works are expensive, and "can only gradually be carried out." Fever of a continued type is stated to have been the cause of considerable mortality in the frontier districts during the earlier months of the year. The Civil Surgeon of Peshawar reports that continued fever was prevalent in the district during the cold-weather months, but the symptoms were those of typhus fever, and that the typhus fever rash was visible in many cases, especially towards the end of the cases. "It would be impossible," he says, "to imagine a more "perfect home for typhus than that offered by the people of this valley. Their "one-roomed houses, 20′ × 25′ × 6′, built to keep out cold, are low and dark, with "not a vestige of ventilation, and no exit except the one door which is made to resist "thieves and draughts. Within them, all through the winter, are agricultural "implements, all the goods and chattels of the master, half-a-dozen head of cattle, "and probably the same number of people."

The deaths registered under dysentery and diarrhœa were considerably below the average. They numbered, during the year, 12,152 or 0·59 per 1,000, a decrease of 5,011 on the figures of 1890, which was attributed to the small amount of rain which fell during the autumn months, and to the moderate prevalence of malarial fevers.

Burma.

Registration of vital statistics in Burma during 1891, as in previous years, was confined to the lower portion of the province. The results show a slight improvement on those of the previous year, but they were still very far from satisfactory. The number of births registered was 95,332, giving a ratio of 20·74 per 1,000, calculated on the Census figures of 1891, compared with 84,769 or 23·2 in 1890, or 19·00 of the population of 1881. There were 73,190 deaths registered, equal to 15·93 per 1,000, against 63,591 in 1890. There can be little doubt that both birth and death ratios are much below the true figures, and this is further shown by the wide variations between the ratios of different districts, ranging in births from 12·88 in Thongwa to 30·53 in Tharrawaddy, and in deaths from 10·85 in Amherst, to 25·08 in Hanthawaddy. The Officiating Sanitary Commissioner (Surgeon-Major P. W. Dalzell) estimates that half the deaths among the rural population escape registration; but hopes are entertained that the scheme recently introduced of utilising the services of the vaccination staff in testing district registration will result in some improvement.

From all the chief diseases except small-pox there was a rise in mortality as compared with the previous year. Cholera deaths increased from 1,076 to 2,400 or 0·52. As in 1890 there was very little cholera in the Arakan division of the province, Akyab being the only district out of three which recorded deaths (12) from the disease. The two districts of Tavoy and Mergui enjoyed almost complete immunity from cholera, the deaths being only two and one respectively. About a third (889) of the total cholera deaths was reported from Thongwa. The disease prevailed throughout the year, April and May being the most fatal months, with a mortality of 353 and 513 respectively. Of the total 17,807 villages in Lower Burma, 547 registered cholera deaths against 397 in the preceding year.

There was a decrease of 2,367 deaths under small-pox; the number registered was 1,326, or 0·29 per 1,000 against 3,693 in 1890. The districts of Sandoway, Mergui, and Toungoo were exempt from the disease, and Tavoy recorded only one death. Only 11 deaths were returned from the Arakan division. The greatest decrease was in the case of Prome district, in which there was the satisfactory decline from 870 deaths in 1890 to 18 in the year under notice. Nearly two-thirds of the mortality occurred among children under 12 years of age. The districts most severely affected were Henzada (322 deaths or 0·73 per 1,000), Pegu (274 or 0·91), Hanthawaddy (242 or 0·54), and Thongwa (240 or 0·54), together accounting for 1,078, and leaving only 248 for the remaining 12 districts.

The deaths ascribed to fevers amounted to 35,658 or 7·76 per 1,000, an increase of 3,426 on the number registered in the previous year. The provincial ratio was exceeded in seven districts, of which Akyab recorded the highest, viz., 11·84., Prome following with 11·72, Sandoway with 10·79, and Mergui with 10·62. The heaviest mortality occurred in August, but fevers were very prevalent during the four subsequent months.

Under dysentery and diarrhœa 4,162 deaths were registered, equal to a ratio of 0·91 per 1,000, which was exceeded by seven districts, three (Sandoway, Hanthawaddy, and Toungoo) having returned death-rates of over 2 per 1,000.

Central Provinces.

The public health of the Central Provinces in 1891 was not so satisfactory as in the previous year. The monthly mean humidity of the province was higher than usual

for half the year, and the mean rainfall (63·63 inches) was 12·58 inches above the average of the last 25 years. Progress continued to be made in the registration of births. The number of births recorded was 379·918 or 43·09 per 1,000 of population, based on the Census figures of 1881, those for the recent Census not being available when the Sanitary Commissioner's (Surgeon-Colonel Pilcher) report was written. Compared with 1890 there was an increase of births in 1891 of 41,274, in which all the districts participated except Sambalpur. Nimar district, as usual, returned the highest birth-rate (54·45), and the lowest (35·58) was recorded in the Saugor district. In 14 of the 20 districts of the province the births exceeded the deaths. Deaths were registered to the number of 313,364 or 35·54 per 1,000, exceeding the mortality of 1890 by 26,610; this excess was spread over all the districts but five, and more than half of it was due to cholera. The highest district death-rate (46·84) was recorded by Hoshangabad, and the lowest (25·65) by Bilaspur. As usual the greatest mortality was among children under five years of age, the deaths in this class being 45 per cent. of the total as compared with 43 per cent. in the previous year.

The total deaths from cholera amounted to 21,312 or 2·42 per 1,000 of the population, being 16,525 more than in 1890. The disease prevailed in all the districts, but in Sambalpur and Burhanpur the mortality from it was very slight. Six districts suffered very severely, Hoshangabad coming first with a death-rate of 7·37, Murwara 6·43, Narsinghpur 5·91, Damoh 5·70, Jubbulpore 5·54, and Mandla 3·98. In many places the disease is reported to have been introduced by pilgrims or other persons returning from fairs or large gatherings of people, a theory, the Army Sanitary Commission point out, which "is too apt to be readily accepted as a satisfactory explanation of "cholera epidemic. The disease was brought to the place, and that is sufficient. "But the remarkable contrasts between epidemic and non-epidemic years, the "prevalence of the disease over certain well-defined areas, and the comparative escape "of others, the wide distribution of the epidemic over a province. and yet the small "proportion of villages attacked, these and many other noteworthy facts that might "be cited, all tend to show that the belief in importation affords but a very incomplete "solution of the problem. . . . The only practical measures that can be taken, "must be directed to searching out local defects, and remedying them as far as "possible, and to this end all reports, both from Civil Surgeons and the other sanitary "authorities should be more especially directed." Out of 29,157 villages in the provinces deaths from cholera were reported from 2,085.

Small-pox was less prevalent than usual, the deaths numbering only 748 against 2,265 in 1890. Of these 511 occurred among children under 12 years of age. The ratio per 1,000 of population (0·08) was the least of any of the preceding 18 years. All the districts were affected except Jubbulpore, and at Damoh only a single death from the disease was reported. Bhandara district suffered most with 190 deaths or 0·27 per 1,000, a ratio however below the mean of the previous five years.

The deaths registered from fevers were fewer than in 1890 by 1,338, the total for 1891 being 190,550 or 21·61 per 1,000 against 191,888 or 21·76. In ten districts there was a decrease in mortality as compared with 1890, in nine an increase, and in the remaining one a similar ratio.

From dysentery and diarrhœa 20,889 deaths were registered, exceeding the figures of 1890 by 3,168. The Sanitary Commissioner thinks that many casualties from cholera are probably included under these heads. In all the districts except four (Murwara, Burhanpur, Betul, and Nagpur) there was a more or less increased fatality from these complaints. The district death-rates ranged from 5·30 in Sambalpur, and 5·21 in Jubbulpore, to 0·27 in Bhandara; the provincial average mortality (2·37 per 1,000) was exceeded in eight districts.

Assam.

Registration of vital statistics continued to be very defective in Assam. In the year under review 143,548 births were recorded, representing a ratio of 28·59 per 1,000 of the population, against 138,326 or 30·56 in 1890. The decrease in the ratio of 1891 was mainly due to its having been calculated on the recent Census population, which showed an increase of 494,125 as compared with the Census figures of 1881. The district birth-rates ranged between 34·09 in Sylhet and 21·32 in Kamrup. As an example of the untrustworthiness of the statistics, the birth-rates of the sadr towns varied from 3·98 to 35·64 per 1,000 of the population. The deaths registered during the year amounted to 150,156 or 29·91 per 1,000 against 134,195 or 29·64. The recorded death-rate of the province thus exceeded the birth-rate by 1·32 per 1,000. The district ratios of mortality ranged from 35·91 in Goalpara to 19·91 in Sibsagar. The

increase in deaths was spread over five out of the nine districts of the province, but was chiefly noticed in the two districts (Cachar and Sylhet) comprising the Surma Valley, in which there was an excess of 19,052 on the deaths registered in 1890.

The rise in mortality was common to all the chief diseases, and was especially marked under cholera, the deaths from which rose from 15,396 or 3·40 per 1,000 to 23,882 or 4·76, an increase of 8,486. The greater part of this excess occurred in the Surma Valley, while in the Brahmaputra Valley the increase of 1,276 was confined to two of the six districts. The increase in cholera mortality is considered to have been mainly due to the great festival of Ardhoday. "For this festival," it is reported, "all who "could manage it, went to Calcutta or to Murshidabad to bathe in the Ganges. The "pilgrims returning came back with cholera. Every steamer arriving here (Dhubri) "had cholera-stricken pilgrims on board." A secondary cause assigned is the Manipur expedition, which brought a considerable influx of persons from India, among whom cholera was very prevalent. "Whatever opinions may be entertained on the question "of human intercourse," the Army Sanitary Commission state, "we entirely concur "with the Sanitary Commissioner in his opinion as to the great importance of "sanitary improvements as the great, and we believe the only, efficient means of "preventing cholera. 'I find,' he says, 'that wherever sanitation has not been "'brought into practice and in use, there cholera, when it appears, has a greater and "'more serious incidence,' and under this general head of sanitation he, very properly, "includes not only pure drinking water, but also good conservancy, good food, and "good drainage."

The mortality from small-pox rose from 1,401 in 1890 to 2,361, an increase of 960 deaths, which was almost entirely due to the results in the two districts (Cachar and Sylhet) of the Surma Valley, and in the district of Kamrup. The increase in Cachar from 265 to 739 was stated to be mostly due to inoculation, and partly to defective vaccination; and in Kamrup from 312 to 640 to neglect of vaccination in the district; while the cause of the comparatively slight increase in Sylhet from 781 to 908 is not stated.

Fevers caused 1,186 more deaths than in 1890, the number having risen from 74,779 to 75,965 or 15·13 per 1,000. This increase was attributed to the advance of kala-azar, from which alone there were 9,937 deaths during the year. The provincial increase of mortality under fevers was, with a few slight and unimportant exceptions, confined to the Sylhet district, and was attributed to the small rainfall (117·12) inches, which was less by 66·78 inches than in 1890, and also than in any year since 1871. The Civil Surgeon reports: "Why the year should be so malarial, I don't know, but "I would venture the opinion that the smaller rainfall has had something to do with "it. It has been generally accepted that completely submerged tracts are compara-"tively salubrious, while ground only partially submerged is most unhealthy. "The cleansing effect of 66 inches of rain (the difference in fall between this and the "preceding year) must not be lost sight of as an additional factor." Dr. Giles, an officer specially experienced in bacteriology, who was deputed by the Government of India to enquire into kala-azar, submitted a report on the subject in the winter of 1890. As stated in last year's report, he believes the disease to be essentially the same as that known as anæmia, or beri-beri of Ceylon. As a result of Dr. Giles' report, various measures, such as the opening of dispensaries in kala-azar centres, were being taken, which it is hoped may do something to prevent the spread of this fatal disease.

From dysentery and diarrhœa 14,418 deaths were registered, equal to 2·87 per 1,000, which is an increase of 1,403 on the previous year. It is thought, however, that some of the deaths registered under this head, were really due to kala-azar, persons with this disease sometimes suffering from dysentery and diarrhœa; and "as diarrhœa is one of "the symptoms of kala-azar, either dysentery or diarrhœa, when only thus a symptom, "is apt to be registered instead of the true disease."

Madras.

The year 1891 in the Madras Presidency was not a healthy one: the rainfall (38·26 inches), was lower than that of any of the previous years, and affected all the districts but three; but the deficiency was most marked in the three central districts on the east coast, viz., Madras, Nellore, and Chingleput. With the failure of the rains the prices of the principal food grains, which had been steadily rising since 1887, rose still higher. The record of births and deaths shows that 924,238 births were registered during the year, equal to a ratio of 32·4 per 1,000, based on the census population of 1881, which is the highest rate yet recorded, against 893,645 or 31·3 in 1890. There was thus an increase of 30,593, to which all the districts but five contributed. The district birth-rates ranged from 44·7 per 1,000 in Madras, to 22·7 in Godavari. In all districts

except Madras and South Arcot, there was an excess of births over deaths registered, the total increase for the Presidency being 6·2 per 1,000. In Madras district the deaths, owing to the prevalence of cholera, fevers, and bowel complaints, exceeded the births by 14·7 per 1,000.

The mortality of the year was higher than had been recorded in any of the previous 20 years, except the famine years 1877 and 1878, and was mainly due to the ravages of cholera, though improvement in registration is thought to have had something to do with the increase. The number of deaths registered was 747,558 or 26·2 per 1,000 against 650,394 or 22·8 in 1890. Of these 37·3 per cent. were among children under five years of age. Mortality was higher in all districts except Salem and South Canara, the highest death-rate being recorded as usual by Madras (59·4) followed by South Arcot (35·3); while Ganjam recorded the lowest (13·5). This variation shows the defectiveness of registration, and the attention of the Collectors of some of the districts has been invited to the matter.

The increase in the mortality of the year occurred under all the heads of disease except fevers. Cholera prevailed with great severity, and the epidemic was the severest since 1877. The deaths from the disease numbered 98,773 or 3·5 per 1,000, nearly treble the number of the previous year (35,228). All the districts were affected, and in no month of the year was cholera absent from the Presidency. In the districts of Vizagapatam, Ganjam and South Canara the mortality was slight, but only in Tinnevelly was the death-rate from the disease lower than in 1890. The districts which suffered most were South Arcot with a death-rate of 8·8 per 1,000, Madura 5·9, Bellary Anantapur 5·6, Cuddapah 5·5, and Chingleput and Coimbatore 5·0 each. Of the 77 towns in the Presidency 65 sufferred from cholera, Palin town again figuring first with a ratio of 21·9, Nellore, Adoni, Anantapur, Chidambaram, and Dindigul coming next with ratios ranging from 18·9 to 10·6 per 1,000. Out of 44,449 villages 8,977 or 20·2 per cent. were affected by cholera. "The reports of the year," the Sanitary Commissioner (Surgeon-Lieutenant Colonel Laing) states, "do "not cast any new light upon the etiology of the disease, but it may be safely assumed "that, however obscure the origin and behaviour of the epidemic may be, yet its "spread in a place depends largely on the sanitary conditions present, and the very "inferior water-supply. In consequence of deficient rainfall in 1891, many of the "tanks and wells, which were drinking water supplies, became dry, and people had to "use any water they could obtain. Further, owing to the drought, the water in the "tanks and wells was much reduced in quantity, and therefore had a much larger "percentage of dissolved and suspended impurities."

The registered deaths from small-pox rose from 28,092 in 1890 to 41,322, representing 1·4 per 1,000 of the population. Children, as usual, were the chief sufferers, just over a half (54·1 per cent.) of the mortality having been recorded among those under twelve years of age. This, however, is an improvement on the previous year, when the percentage was 65·8, "and shows," the Government observe, "how much local bodies "can yet effect, if they pay due attention to infantile vaccination." The disease was present in all the districts, but although the mortality was much greater compared with 1890, the death-rates of eleven districts were lower. The highest small-pox mortality was recorded in Kistna (5·3), Malabar (2·7), South Arcot (2·6), and Madura (2·4). The towns suffered more in proportion than the districts, the death-rate of the former being 2·1 against 1·4 in the latter. Some of the municipal towns suffered very severely. Calicut headed the list of 44 out of a total of 55, in which deaths from the disease occurred, with a ratio of 20·4, the rate for the district being 2·7. This high mortality the Sanitary Commissioner ascribed to the unsatisfactory manner in which vaccination is carried on in this town. The special attention of the Municipal Council has since been drawn to the matter.

Fevers were the cause of 247,029 deaths, representing a ratio of 8·6 per 1,000 of population, against 262,855 or 9·2 in 1890. The decrease was general, all the 22 districts but six having recorded a lower mortality, mainly owing to the absence of influenza, which was very prevalent in 1890. Of the districts, Kurnool, Madras, Nilgiris, Cuddapah, and Vizagapatam, suffered most severely, their death-rates varying from 21·1 to 14·3 per 1,000. The district presidency rate under this head was 8·8, while that of the municipalities was 2·4 less (6·4), the lower rate of the towns being partly due "to the indiscriminate classification of all diseases with inflammatory "symptoms as fever in the more rural or less-educated tracts of the country."

From dysentery and diarrhœa there were 34,223 deaths registered, yielding 1·2 per 1,000 against 26,608 or 0·9 in 1890. As usual, Madras recorded the highest district

death-rate of 11·5 per 1,000, followed by Chingleput with 4·2; in the remaining districts the mortality ranged from 2·2 in Malabar to 0·2 in Ganjam.

Bombay. Registration of vital statistics in the Bombay Presidency during 1891 was attended with fairly satisfactory results. In the case of several districts, however, improvement is still required. The total number of births recorded in 1891 was 682,677 or 36·27 per 1,000 against 641,115 or 38·97 in 1890. This falling off in the ratio, is however, only apparent, as the results of the year under notice were calculated on the Census figures of 1891 (18,820,346) showing an increase of 2,402,630 on the previous Census population of 1881, on which the rates of 1890 were based. Of the 24 districts in the Presidency, all but five recorded more births than in 1890, and of these the most marked case was the City of Bombay with a birth-rate of only 18·86. Eleven districts registered birth-rates of over 40 per 1,000 and seven of over 30 per 1,000.

Under all the chief diseases except small-pox, there was an increased mortality, and the total number of deaths registered rose from 463,616 to 513,132 or 27·26 per 1,000, which was made up of district ratios ranging from 42·11 in Broach to 14·99 in Upper Sind Frontier. There were also great differences in the ratios of towns (ranging from 10·25 to 64·01 per 1,000). The Bombay Government proposed calling the attention of the district officers to the necessity for improving registration in the districts in which the results were unsatisfactory. Only two districts, the City of Bombay and Broach, registered higher death-rates than birth-rates, the excess in the case of the former being 10·29 per 1,000, while in the latter there was very little difference. The mortality amongst young children was, as usual, very high. Of the total deaths 22·18 per cent. occurred among infants under one year of age, and between one and five years the percentage was 21·61, so that the deaths among children under five years of age formed 43·79 per cent. of the total mortality of the Presidency.

Cholera caused 17,850 deaths or 14,590 more than in 1890, the ratio being equal to 0·95 per 1,000 of population. All the districts were affected, but in several the number of deaths was very small. The epidemic was principally confined to the Deccan districts of Bijapur, with 5,064 deaths or 6·36 per 1,000, Sholapur 2,442 or 3·25, Poona 2,316 or 2·18, and Ahmednagar 2,284 or 2·57, together accounting for 12,106 of the total cholera mortality. These results, it is stated, were probably due, for the most part, to the unfavourable nature of the season and the scarcity of water in the Deccan. The disease was present the whole year, but the great majority of the deaths (15,533) occurred in the five months May to September, July and August being the most fatal months, when 3,692 and 4,443 deaths respectively were recorded. Of the 25,143 villages in the Presidency, 1,594 were affected by cholera.

There were only 1,491 deaths from small-pox recorded as compared with 2,877 in 1890, and a decennial mean of 5,087. Two districts (Thar and Parkar and Upper Sind Frontier) were entirely free from the disease, while in no district was the mortality severe. The highest district ratio was 0·24 per 1,000 in Khandesh. According to age, 27·50 per cent. of the deaths occurred among infants under one year of age, and 50·17 per cent. among children between one and twelve years of age.

Under fevers, 368,913 deaths were registered, representing a ratio of 19·60 per 1,000, and showing an increase of 24,016 on the number of the previous year. The increase was spread over 10 of the 24 districts, Broach heading the list with 37·30 per 1,000 or 3·52 in excess of its fever rate of 1890. Seven other districts also recorded fever death-rates higher than the Presidency rate, ranging from 31·44 to 20·17. The most fatal month was December, when 50,954 deaths were reported which was attributed to a return of the influenza epidemic in the latter portion of the year.

To dysentery and diarrhœa 37,728 deaths were ascribed, equal to 2·00 per 1,000, against 36,037 in 1890. The death-rate was lower in all the districts but eight, the highest recorded being 5·69 in Belgaum, Dharwar coming next with 4·82, Bijapur 4·71, Khandesh 4·22, Nasik 4·18, and Ahmednagar 3·11. In no other district was the Presidency rate reached.

Berar. The vital statistics of Berar for 1891 point to steady progress towards greater accuracy in registration. In every district more births were registered than in the previous year, the aggregate number being 121,755, an excess of 10,305 on 1890. Calculated on the Census population of 1891, which exceeded that of 1881 by 2,840,406, the birth-rate was 42·8 per 1,000. The district rates ranged from 47·6 in Akola to 34·8 in Wun, the low rate of the latter being attributed to defective registration. The year was an unhealthy one, owing to the prevalence of cholera and bowel complaints in more than average intensity. The deaths aggregated 115,558 or 40·6

per 1,000, an excess of 22,538 over the number registered in 1890. The increase was common to all districts, the death-rates of which ranged from 47·6 in Akola to 30·0 in Wun. The urban and rural mortality rates were 40·9 and 40·6 respectively.

There was an increase in mortality under all the chief diseases except small-pox. Deaths from cholera rose from 847 in 1890 to 7,958 or 2·8 per 1·000. With the exception of April and May, the disease prevailed during each month of the year, attaining its maximum in August and September, when 3,139 and 3,081 deaths respectively were registered. Of the districts the principal sufferers were Buldana and Basim, which recorded cholera death-rates of 4·0 and 3·6 per 1,000; the lowest mortality-rate 1·2, was returned by Wun. The departmental reports, the Sanitary Commissioner (Dr. Little) states, do not cast any new light upon the etiology of cholera. Civil Surgeons paid considerable attention to the investigation of the disease. They attributed the outbreaks to a general prevalence of local insanitary conditions rather than to any special exciting cause, and the Resident directed that this opinion should be impressed upon Taluk Boards, so as to bring home to them the vast importance of village sanitation. The deaths were all reported from 532 out of the total 5,655 villages.

Small-pox was remarkably quiescent during the year. Only 34 deaths were recorded as compared with 324 in 1890, and the death-rate was only ·01 per 1,000, results which the Army Sanitary Commission notice, bear evidence of the efficiency of vaccination. Five out of the six districts were affected, Wun the most severely with 15 deaths. Ellichpur was exempt from the disease. All the deaths but six occurred among children under 12 years of age.

The mortality ascribed to fevers was very severe, amounting to 49,850 or 17·5 per 1,000 against 47,894 in 1890. According to districts, the death-rate ranged from 21·3 in Wun and 20·9 in Akola, to 11·9 and 14·2 in the Basim and Buldana respectively. September, October, and November were the months of greatest fever prevalence, and the first four months of least prevalence. Influenza, which caused a most abnormal fever mortality in April of 1890, was absent during the year under notice.

Dysentery and diarrhœa accounted for 22,007 of the year's deaths, yielding a ratio of 7·7 per 1,000 of population, an increase of 8,679 on the mortality of 1890. The provincial ratio was made up of district rates ranging from 13·3 in Ellichpur to 2·1 in Wun.

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IV.—JAILS.

Sickness and mortality in 1891.

The health of the jail population of India during 1881 was on the whole satisfactory In the admission and constantly-sick rates there was a substantial reduction as compared with the previous year, the former having declined from 1,142 to 979 per 1,000 of average strength, and the latter from 36 to 34 per 1,000; while the death-rate fell from 30·68 to 30·19. Of the ten provinces, six returned a higher jail death-rate than in 1890, the most noticeable case being Assam, where the health of the prisoners during 1891 was markedly unsatisfactory. The health statistics of the Madras jails were also very unfavourable. Cholera was present in some jails in all the provinces, except the Central Provinces, Berar and Coorg, and accounted for 324 deaths, equal to a ratio of 3·48 per 1,000 of average strength against 146 or 1·66 in 1890. Fevers also were slightly more fatal, but dysentery and diarrhœa showed a somewhat decreased mortality.

The following statement shows the sickness and mortality among all classes of prisoners in the jails and subsidiary jails of the several provinces for 1891, as compared with the previous year:—

Provinces.	1891.			1890.		
	Ratio per 1,000 of Average Strength.			Ratio per 1,000 of Average Strength.		
	Admissions.	Daily Sick.	Deaths.	Admissions.	Daily Sick.	Deaths.
Bengal - - - -	1,170	38	30·97	1,251	39	32·27
North-Western Provinces and Oudh	781	34	27·62	990	36	33·54
Punjab - - - -	1,746	40	28·30	1,937	47	31·23
Burma - - - -	891	34	30·12	1,002	38	28·24
Central Provinces - - -	792	28	30·37	1,017	31	26·06
Assam - - - -	1,742	63	52·11	1,987	56	36·29
Coorg - - - -	1,458	50	32·64	2,295	63	30·96
Madras - - - -	637	21	35·33	731	24	23·85
Bombay - - - -	676	25	32·44	827	27	31·98
Berar - - - -	440	21	11·29	678	21	18·17
India - - - -	979	31	30·19	1,142	36	30·68

Bengal.

The vital statistics of the Bengal jails for 1890 show a further improvement in the health of the prisoners. The rate of admissions to hospital fell from 1,251 per 1,000 of average strength in 1890 to 1,170, the daily sick-rate from 39 to 38, and the death-rate from 32·27 to 30·97, "a result," the Lieutenant-Governor observes, "which "is most satisfactory, and should encourage superintendents of jails to continue their "exertions in the direction of improved sanitation." The reduction in mortality was to an extent due to an alteration in the rules regarding the release of sick prisoners. The number of such releases rose from 39 in 1890 to 105 in 1891, "and it can hardly "be doubted" the Government of India observe, "that, but for these releases "the mortality would have been higher." Among all classes of prisoners the deaths numbered 493, of which 54 were from cholera, 147 from bowel complaints, and 141 from fevers. Of the total deaths 454 occurred among convicts representing a ratio of 31·4 per 1,000 of average strength against 33·2 in 1890. All but 10 of the 454 convict deaths took place in other than subsidiary jails, and of these only 150 were received into jail in good health, while 153 were found to be in indifferent health, and 141 in bad health. Dr. Lethbridge states that from his experience of a large number of jails in all the provinces of India, he can safely say that there is no other province which receives so many moribund prisoners. Of the 46 jails in the province, 21 returned a death-rate exceeding the provincial rate, and of these six recorded mortality rates of over 50 per 1,000, viz., Purnea 131·2, Shahabad 104·9, Rangpur 94·3, Puri 91·2, Dinajpur 88·3, and

Saran 62·2. The high rate in the Purnea jail was the result of 12 deaths, of which six were of prisoners admitted in very bad health, who were at once sent to hospital, where they died a few days afterwards. Many other prisoners were admitted in this jail in bad health, which was accounted for by the general unhealthiness of the district. This cause also, in the opinion of Dr. Lethbridge, influenced the death-rate in Dinajpur jail, where nine of the 15 deaths were of convicts admitted in indifferent health, and four in bad health. Seven of these cases had been less than six months in jail. Cholera was the cause of the high mortality in the Shahabad jail, contributing 12 out of the total 15 deaths. The large mortality in the Rangpur jail was due partly to an epidemic of cholera, and also to the unhealthiness of the prisoners received from this malarious district. Out of 23 prisoners who died, 12 were admitted in bad health, 10 in indifferent health, and only one in good health. The Puri jail is a small one, and its high death-rate (91·2) represented six deaths, two of which were due to diarrhœa, and one to cholera. Cholera was also the chief cause of the mortality in Saran jail, five fatal cases out of a total of 17 deaths having resulted from the disease. In six jails there were no deaths, and in several there was a very satisfactory decrease in mortality as compared with previous years.

North-Western Provinces and Oudh.

The year 1891 in the North-Western Provinces and Oudh being comparatively healthy, there was an improvement in the health of the jail population. The admissions into hospital per 1,000 of average strength fell from 990 in the previous year to 781, the daily average sick from 36 to 34 per 1,000, and the death-rate from 33·54 to 27·62, which was the lowest recorded since 1866, when it was 22·85. This result, it is stated, speaks well for the excellence of the sanitary arrangements maintained in the jails. The most fatal diseases were cholera, with 95 deaths (3·63 per 1,000) dysentery and diarrhœa, 201, and respiratory diseases 157. Cholera had been steadily increasing since 1888; in the year under notice it affected 14 jails (four being Central prisons) as compared with eight in 1890; and the disease was an important factor in raising the death-rate at Lucknow, Benares, Fyzabad, and Bareilly. Of the total 780 deaths, 726 occurred among convicts, yielding a ratio of 27·78 against 33·62 in 1890. This average death-rate was exceeded in 26 jails, the highest being 82·57 in Hamirpur, though this is an improvement on the ratio of the previous year. Of the 16 convicts who died in this jail, 4 were admitted in very bad health, and 8 in bad health. Gorakhpur jail came next with a mortality rate of 74·89 against 86·75 in 1890, the bad state of health of convicts entering the jail being the chief cause of this high death-rate. The construction of a new jail in this district was about to be commenced. To the same cause was attributed the Benares jail death-rate of 62·23. Of the 26 prisoners who died in this jail, only five were admitted in good health. Five other jails recorded death-rates of over 50 per 1,000, four of over 40, and 12 of over 30 per 1,000. Much was done during the year in improving the sanitary condition of the jails, in accordance, in many cases, with the recommendation of the Jail Committee.

Punjab.

The health of the jail population of the Punjab during 1891 was, on the whole, satisfactory. There was overcrowding in seven jails, the chief reason assigned being the prevalence of cholera in adjacent districts which prevented the transfer of prisoners to other jails. The matter of overcrowding was receiving attention, with the view of ascertaining which jails were more commonly liable to it than others. Admissions to hospital were in the ratio of 1,746 per 1,000 of average strength against 1,937 in 1890. The daily average sick-rate fell from 47 to 40, and the death-rate from 31·23 to 28·30. This is the third year in succession in which the mortality in the Punjab jails has been below that of the free population, "and this," it is observed, "though, "while the prison statistics are quite accurate, many deaths occur among the free "population which must escape report." In three jails out of the total of 33 there were no deaths; in 15 the death-rate was less than 15 per 1,000, while in 14 others the provincial rate was exceeded, the ratios ranging from 57·76 in Dera Ghazi Khan, to 34·87 in Lahore central jail. Among the convicts the rate of mortality was 27·94 per 1,000 as compared with 31·89 in the previous year. Under all the principal diseases the deaths were fewer than in the previous year. From dysentery and diarrhœa there was a considerable decrease in the number of convict deaths, from 84 in 1890 to 51; there was also a satisfactory fall in the deaths from respiratory diseases, from 160 to 121, which would have been still more marked, it is stated, "had not so many "of our jails suffered from influenza followed by pneumonia of a severe type." From cholera there were 12 deaths, an increase of seven on the number recorded in the previous year. These were confined to the two jails, Ludhiana and Lahore, which returned six deaths each. In both instances the prisoners were moved into camp with

satisfactory results. In several jails there was a great improvement in the health of the convicts. Among them may be instanced the Amritsar jail, which has always been one of the most unhealthy in the province, with a death-rate of less than 12 per 1,000. The Dharmsala jail is another that has been generally unhealthy, but which showed a greatly reduced mortality, viz., from 69·30 per 1,000 in 1890 to 9·90 in 1891. The death-rate at Rawal-pindi also fell from 26·72 to 9·92. These results were greatly due to the care bestowed by medical officers on matters affecting the health of the jails under their charge. The high rate of mortality in the Dera Ghazi Khan jail (57·76) was the result of 16 deaths, six of which were due to remittent fever, and four to dysentery. The same fever was also the cause of four deaths, out of a total of 10, in the Kohat jail, whose mortality rate rose from 6·89 per 1,000 to 54·36. The next highest death-rate (51·28) was returned by the Gujranwala jail, where out of 20 deaths nine were due to respiratory affections. It is noticed that the comparatively severe mortality among convicts who had been a long time in jail, which characterized the years 1887 and 1888, did not prevail in 1891. In fact, except in the case of convicts who had been more than seven years in jail, and regarding whom the rate of mortality (47·62) was still high, statistics show that a higher rate of mortality in proportion to the length of sentence had almost ceased to prevail.

Burma. There was less sickness among the prison population of Burma as compared with 1890, but owing to severe outbreaks of cholera the mortality was higher. For the whole province the admissions to hospital were in the ratio of 891 per 1,000 of average strength in 1891 against 1,002 in the previous year; the ratio of daily average sick was 34 or 4 per 1,000 less, while the death-rate rose from 28·24 to 30·12 per 1,000. Of the chief diseases cholera contributed 52 deaths out of 67 cases, against 19 and 29 respectively in 1890. The disease was present in eight of the 30 jails, but only in three of them did it assume epidemic proportions. Serious outbreaks occurred at Toungoo and Moulmein. At the former 28 prisoners died out of 37 attacked, and at the latter 14 out of 15 cases proved fatal. A serious epidemic of cholera also occurred at Bassein jail, where out of seven cases five were fatal. In all these instances cholera prevailed in the town before it broke out in the jail. All the cholera deaths but two occurred in the jails of Lower Burma. Dysentery and diarrhœa accounted for 86 deaths, and fevers 26. Respiratory diseases were more fatal, the deaths having increased from 47 in 1890 to 53. During the year 28 convicts were released on account of serious illness. The majority had not been a year in jail, and were in bad or indifferent health on admission. Anæmia and diarrhœa were the chief disorders from which they suffered. Of the total 345 deaths 333 occurred among convicts, equal to a ratio of 30·10 per 1,000 of their average strength.

Central Provinces. Although there was an increase in the daily average strength of the jails in the Central Provinces in 1891, there was a marked decrease in the number of admissions to hospital as compared with the previous year. The sickness, however, must have been of a more serious character, as there was an increased mortality. Among all classes of prisoners the admission-rate was 792 against 1,017 in 1890, the daily sick rate 28 against 31, and the death-rate 30·37 against 26·06. The decrease in the admissions was attributed to the immunity which the jails enjoyed from epidemics. The chief causes of the increased mortality were dysentery and diarrhœa, from which there were 47 deaths, or 13 more than in 1890. Of the total 142 deaths 137 were of convicts, the rate per 1,000 of average strength being 30·7 against 26·5 in the previous year. The mortality in some jails was extremely high. Damoh again came first with a death-rate of 146·6, the result of 13 deaths; Hoshangabad followed with 89·3 (14 deaths), which is an increase of 67·9 on the ratio of 1890; Sambalpur with 58·4, but it appears that a large proportion of the deaths in this jail resulted from causes which had nothing to do with residence in jail; and Saugor with 55·8. It is stated that the physical condition of prisoners received into the jails of Damoh and Saugor goes far to explain the high ratios of sickness and mortality. At the same time, defective drainage of the jail site had in both cases, in the Chief Commissioner's opinion, something to do with the matter, and measures have since been taken to remedy the defects, with satisfactory results. As regards Hoshangabad, only three of the 12 convicts who died were admitted to jail in good health.

Assam. The health statistics of the jails in Assam for 1891 compare very unfavourably with those of the previous year. Among all classes of prisoners there were 2,808 admissions to hospital, representing a ratio of 1,742 per 1,000 of average strength against 1,987 in 1890; the ratio of daily average sick rose from 56 to 68 per 1,000, and the death-

rate from 36·29 to 52·11. This large increase in the death-rate was almost entirely due to heavy mortality among the prisoners returning from the Lushai Hills jail, where they had been sent for road work. The health of the prisoners was excellent from the date of their arrival up to the end of March, when the occurrence of the Manipur calamity rendered their immediate withdrawal necessary. On the road between Silchar and Sylhet, cholera broke out amongst the prisoners, the disease being at that time prevalent along the road. The prisoners returned with their health impaired by the journey, and many succumbed to the disease. Of the total 84 deaths in the Assam jails, all but three occurred among convicts, being in the ratio of 54·29 per 1,000 of average strength against 39·21 in 1890. Cholera accounted for 13 deaths, dysentery and diarrhœa 38, and respiratory diseases 7. Of individual jails the greatest number of deaths took place in that of Sylhet, viz., 28, or 201·15 per 1,000, against 8, or 44·14, in 1890. Of these, 20 occurred among the Lushai prisoners. The Shillong jail also returned a high mortality (8 deaths equal to 242·05 per 1,000 against *nil* in 1890); and four of these eight were among the prisoners returned from the North Lushai Hills jail. During the year considerable sanitary improvement was made in some of the jails, chiefly in conservancy. The water used in the jails is filtered, and the supply is obtained from the best sources available.

Madras.

The health statistics of the jails in the Madras Presidency for 1891 are on the whole of an unfavourable character, and with the two exceptions of 1882 and 1889 the death-rate is the highest recorded for ten years. There was less sickness than in 1890, the ratio of admissions to hospital having declined from 731 per 1,000 of average strength to 637, and the daily average sick-rate from 24 to 21 per 1,000. On the other hand, the mortality was far higher. Among all classes of prisoners the deaths rose from 213, or 23·85, to 347, or 35·33 per 1,000. The increase was almost entirely due to cholera, which caused 90 deaths, an increase of 68 on the number of the previous year. From dysentery and diarrhœa also the deaths were considerably in excess of 1890, viz., 97 against 64. According to individual jails the ratio of deaths ranged from 66·00 in the Penitentiary, Madras, and 64·99 in Rajamundry jail, to 6·33 in Bellary. The Cochin jail was again free from death. The average jail death-rate of the Presidency was exceeded by 10 of the 22 jails. Cholera was the cause of the heavy and exceptional mortality in the usually healthy Penitentiary jail. Thirty-six deaths out of a total of 47 resulted from this disease, and necessitated the removal of the bulk of the prisoners into camp. In the previous year there were only 14 deaths, equal to 20·05 per 1,000, in this jail. There was no epidemic in the Rajamundry jail to account for the large number of 35 deaths, which is an increase of 20 on the previous year's mortality. Nine of the deaths were due to beri-beri, and 17 to dysentery and diarrhœa, and all but seven of the prisoners who died were returned as in good health on admission. The Inspector-General states:—"I can "find nothing in the seasonal occurrence of disease to suggest an explanation. The "matter is one which requires the careful observation of the Medical Officer, and "the state of health of the jail will be watched during the current year." In 13 other jails the recorded death-rate was higher in 1891 than in the previous year. The high death-rate of 53·06 in Parvatipur jail, though lower than recorded for five years, was due to the low state of health of the prisoners when first admitted from the malarious tracts in the neighbourhood. In Guntur jail epidemic cholera was entirely the cause of the high mortality (50·70), eight out of the nine deaths resulting from this disease. Trichinopoly jail, which had a death-rate of 49·72, returned eight deaths from cholera out of a total of 48, and 20 from diarrhœa. These same causes accounted for eight and 13 deaths, respectively, out of a total of 30, in Coimbatore jail. An outbreak of cholera also caused 10 of the 30 deaths in Vellore jail. Of the total 347 deaths, 321 were of convicts, equal to 37·41 per 1,000 of their average strength against 191 or 24·01 in 1890.

Bombay.

There was less sickness among the jail population of the Bombay Presidency during 1891 as compared with the previous year, but a slightly increased mortality, which occurred entirely amongst under-trial prisoners. Among all classes of prisoners the rate of admissions to hospital per 1,000 of average strength was 676 against 827 in 1890, the daily sick-rate 25 against 27, and the death-rate 32·44 against 31·98. More than half (138) of the 253 deaths was contributed by the jails of Sind, with a daily average strength of 2,166, or not much more than one-fourth of the total of 7,799 in all the jails and lock-ups. Excluding the Sind jails, the Presidency ratio drops from 32·4 to 19 7, while dealing with the jails and lock-ups of Sind as a separate group, the ratio of deaths for that province stands at 65·6 per 1,000 of average strength.

Many jails were overcrowded during the year; but that this did not cause unhealthiness is borne out by the fact that those jails which were most continuously overcrowded enjoyed the greatest immunity from sickness. Of the total 253 deaths, 235 occurred amongst convicts, equal to a ratio of 33·7 per 1,000 of average strength, being identically the same as for 1890. Cholera was very little prevalent in the jails; only three were affected, and these yielded nine cases, with three deaths. The chief causes of mortality were respiratory diseases, from which the deaths among the convicts rose from 71 in 1890 to 103; of these 75 occurred in the Upper Sind jails. On the other hand deaths from dysentery and diarrhœa declined from 57 to 35, and from anæmia and general debility from 19 to 12. The jails showing the highest death-rates were the Nara Gang, 109·8; Hyderabad, 81·7; Nasik, 57·7; Shikarpur, 57·4; and Dhuliakot, 56·7; all, with the exception of Shikarpur, being considerably in excess of the ratios of 1890. In the Nara Gang the deaths numbered 47, of which 29 occurred in the month of December, the result of influenza. The epidemic commenced in December, and the ravages caused by it throughout the province of Sind, the Inspector-General states, during the past cold weather will be remembered for many a long day in the villages. Nearly 200 of the prisoners in the gang were suffering from it at one time. Many of the cases of influenza developed into pneumonia. In four jails there were no deaths during the year, and in nine the death-rate was below 33 3 per 1,000.

Berar.

The health of the prison population of Berar during 1891 was again satisfactory. The ratio of admissions to hospital was 440 per 1,000 of average strength against 678 in 1890; the daily sick-rate was 13 per 1,000 against 21, while the death-rate fell from 18·17 to 11·29. The total number of deaths was 12, and of these, nine were of convicts. There was no epidemic of any disease, and cholera was entirely absent from the jails. In two of the seven jails there were no deaths. The Resident agrees with the Inspector-General that in addition to good management these satisfactory results were very likely due, not only to the absence of overcrowding, but also to the ample provision of unencumbered space within the walls of the jails.

V.—VACCINATION.

During 1891–92 there were 5,882,683 persons successfully vaccinated in the several provinces of India. According to age, nearly $2\frac{1}{4}$ millions of the total were children under one year of age, and nearly $2\frac{3}{4}$ millions were children between the ages of one and six years. The proportion of population protected against small-pox was equal to 26·78 per 1,000, which average was made up of ratios ranging from 54·31 in Coorg to 19·10 in the North-Western Provinces, and 19·08 in Burma. In the vaccination of infants the best results were, as usual, obtained in Berar, where 67·9 per cent. of the children born during the year (estimated at 40 per 1,000) were protected. Bombay Presidency came next with a percentage of 58·4, followed by the Central Provinces with 56·8, and the Punjab with 54·5. Of the remaining provinces, only in the North-Western Provinces and Oudh did the successful cases among infants equal 20 per cent. of the estimated births. General results.

Statement showing the total number of persons successfully vaccinated during the year 1891–92 :—

Province.	Population among whom Vaccination was carried on (Census of 1891).	Number of Persons successfully vaccinated.	Ratio of successful Vaccinations per 1,000 of Population.	Number of Children successfully vaccinated.		Percentage of Children born during the Year (calculated at 40 per 1,000 of Population) successfully vaccinated.
				Under One Year of Age.	Between One and Six Years of Age.	
Bengal - - -	67,570,784	1,614,501	23·89	292,438	1,156,139	10·8
North-Western Provinces and Oudh.	47,146,327	900,731	19·10	378,512	432,777	20·1
Punjab - - -	20,553,982	686,879	33·42	448,491	130,753	54·5
Central Provinces - -	*11,029,618	437,312	39·64	250,637	131,054	56·8
Berar - - -	2,850,009	102,596	35·90	77,482	14,950	67·9
Burma - - -	8,097,014	154,528	19·08	35,439	67,784	11·0
Assam - - - -	5,634,258	184,152	32·68	22,256	118,353	9·9
Madras Presidency - -	*30,869,266	970,504	31·43	210,652	515,657	17·1
Bombay Presidency - -	25,710,798	821,196	32·32	600,634	171,075	58·4
Coorg - - -	173,055	10,284	59·42	685	4,188	9·9
Total - - -	219,635,111	5,882,683	26·78	2,317,226	2,742,730	26·3

* According to census of 1881.

Although there was an increase of 92 to the vaccination staff of Bengal in 1891–92 there were 192,890 fewer operations performed, the total number of persons vaccinated having decreased from 1,833,978 in the previous year to 1,641,088. The decrease occurred in all the circles except Ranchi, and was attributed to various causes, such as paucity of subjects owing to the prevalence of small-pox in 1890, when children of very tender age were allowed to be vaccinated, and large numbers of elderly people resorted to vaccination; also to the prevalence of malarious fever and influenza. Of the total number of operations, 1,626,855 were primary cases, of which 98·90 per cent. were successful. According to age, 292,438 of the successful primary vaccinations were of children under one year of age, and 1,155,556 were of children between one and six years old. For the whole province the persons successfully vaccinated per 1,000 of population represented a ratio of 23·89. In connexion with this outturn of work the Army Sanitary Commission remark :—"The most important practical questions are, "How far is the infant population, which is being added year by year, protected "by successful vaccination, and what relation does the mortality from small-pox in "each district bear to the successful vaccinations which had been recorded in it? "In answer to the first question there is no doubt that a vast amount remains to "be done." And they point out that, according to the statistics of the Sanitary Commissioner, there are 2,474,152 infants available for vaccination every year, and that during 1891–92 only 292,438 were successfully vaccinated. The greater part Bengal.

of the year's work was, as usual, carried on by human lymph, but bovine lymph was used to start the operations in each district. In addition to the animal lymph depôt at Calcutta, which has been improved, one has now been established in Darjeeling. "With this depôt in the Hills," Dr. Gregg says, "and the central depôt in Calcutta, "the Vaccination Department is now in a position to dispense with lymph obtained "from the human subject and to supply the whole of Bengal with calf lymph." During the year the reorganisation of the Vaccination Department was completed, and under the new scheme the executive supervision of the work has been transferred to the district Civil Surgeons, while the former Deputy Superintendents and three of the six Superintendents have been ablolished. The Army Sanitary Commission remark that by this measure Civil Surgeons will be able to aid more largely and more directly in the important work of vaccination.

Punjab. In the Punjab the total number of vaccinations performed during 1891–92 was 812,700, as compared with 850,142 in the previous year. The decrease of 37,442 was, however, only in re-vaccinations, and was due to an order forbidding the re-vaccination of children until seven years had elapsed since the previous successful vaccination. It is well, the Lieutenant-Governor considered, that this order had been issued, "otherwise our vaccination operations would become, to a certain extent, "a sham, as vaccinators would, with a view to increasing their tale of work, go on "vaccinating over and over again the children of such parents as felt no objection "to vaccination." Of the total vaccinations, 620,604 were primary cases, of which 94·85 per cent. were successful. The results of inspection testified to the accuracy of this ratio of success, for out of 14,222 cases inspected the Sanitary Commissioner found 96 per cent. efficiently vaccinated; and this was further corroborated by the results of inspections of other officers of the vaccination staff. Children born during the year were protected to the number of 448,491, equal to 54·5 per cent. of the births estimated at 40 per 1,000, and of children between one and six years 130,753 were successfully vaccinated. Of the total population of the province 33·42 per 1,000 were protected from small-pox against 37·15 in 1890–91. Vaccination with animal lymph continued to make satisfactory progress. There were 702,004 operations performed by this method against 581,664 in 1890–91. "In 16 of the 31 districts "of the province practically the whole of the work of the district staff was done with "animal lymph, and in eight of the remaining 15 districts the great majority of the "operations were done with the same kind of lymph." The use of animal lymph, the Sanitary Commissioner says, is making the work of vaccination more popular than it was, as it obviates the necessity of using children as vaccinifers, though a good deal of passive opposition is still met with in Hindus, and especially Khatris.

North-Western Provinces and Oudh. Vaccination work in the North-Western Provinces and Oudh continued to make satisfactory progress during 1891–92. The total persons vaccinated numbered 1,059,981, being an increase of 70,812 on the operations of the previous year. The increase, however, was not general, as there was a decrease in 14 districts, of which only two were in Oudh, and in these two the number of persons successfully vaccinated per 1,000 of population compared favourably with the provincial average. Of primary vaccinations there were 1,017,266, and of these 91·66 per cent. were successful. Among infants there were 7,781 fewer successful cases than in 1890–91, the number having fallen from 386,293 to 378,512; while among children between one and six years of age the number rose from 388,703 to 432,777, an increase of 44,074. The Sanitary Commissioner attributed the decline in the successful vaccinations among infants to the smaller number of births during the year, but in fact the proportion of infants vaccinated was actually greater than in the previous year. The proportion of the population successfully vaccinated was extremely low, only 19·10 per 1,000, almost the same as in 1890–91. In consequence of the action taken by the Local Government in drawing the attention of the municipal authorities to the advantages of the Vaccination Act, 66 municipalities out of 103 were at the close of the year brought under the provisions of the Act, and in three more proceedings for its extension were pending. In addition, the Act was in force in five cantonments, and steps were about to be taken with a view to extending it to the remaining cantonments of the province. For the first time vaccination was carried on in the province without a supply of lymph from England. Depôts for the production of animal lymph were maintained at nine districts, seven of which were in Oudh.

Burma. The total number of vaccinations performed in Lower Burma during 1891–92 was 130,438, being 12,807 less than in the previous year. The decrease was chiefly

noticeable in the five districts of Prome, Thongwa, Henzada, Thayetmyo, and Toungoo, and was attributed chiefly to the absence of small-pox. The Civil Surgeon of Prome, reported that the attitude of the people was very favourable to vaccination, particularly in the town, where the total absence of small-pox has followed upon the introduction of compulsory vaccination. The number of persons primarily vaccinated was 92,748, with a percentage of success of 85·15, which was much below that of other provinces. Of the total 78,979 successful primary vaccinations, 20,535 were of children under one year of age, which, as the Army Sanitary Commission notice, is not very satisfactory when compared with the registered births (95,332) of the year. Of children between the ages of one and six years, 40,135 were protected. During the year the Vaccination Act was extended to the municipal towns of Yandoon, Thaton, and Mergui, and to the cantonment of Thayetmyo. At the close of the year the Act was in force in all the municipalities but seven, of which Pegu is the most considerable, and in all cantonments but one.

In Upper Burma 61,454 persons were vaccinated during 1891–92, being an increase of 18,542 on the number of the previous year. Of this increase Mandalay contributed 10,722, which was mainly due to the extension of the Vaccination Act to the municipality and cantonment. There were 61,220 primary cases, of which 85·35 per cent. were successful. Besides Mandalay, the Vaccination Act was extended during the year to the municipalities of Myingyan, Pagan, Salin, Pyinmana, and Yamethin. There appears to be a widespread prejudice against vaccination throughout the whole province.

Assam.

Further progress was made in vaccination work in Assam during 1891. The total number of vaccinations was 206,331, being an increase of 19,221 on the previous year. The increase was spread over all the districts except Kamrup, Darrang, and Sylhet. In the Naga Hills district there was an increase of 10,430 operations, and in the Goalpara district of 4,137. The work done in the tea gardens decreased considerably, from 13,387 cases to 9,285; there was however a slight increase in the percentage of successful cases, from 80·18 to 82·76. For the whole province the primary operations numbered 197,572, of which 91·59 per cent. were successful against a corresponding percentage of 86·58 in 1890–91. This improvement was attributed to the better quality of the lymph from the depôt at Shillong, which was established in 1890, and the success of which the Chief Commissioner now considers assured. Exclusive of tea gardens, but including dispensary work, 22,256 of the 184,225 successful primary cases were of children under one year old, and 118,353 were of children between one and six years of age. A comparison of the number of infants successfully vaccinated with the registered births of the year (143,548) shows, notwithstanding the steady progress which had been made of late years, as the Army Sanitary Commission point out, "how much still remains to be done before the Vaccination Department can "expect to exercise efficient control over small-pox." There was also an improvement in inspection work. Out of the total 206,331 vaccinations, 101,197 cases were verified, and of these 92,978 or 91·88 per cent. were found successful, as compared with 89,575 or 90·83 per cent. in the previous year. The Compulsory Vaccination Act was further extended during the year, and has now been introduced into nine municipalities and stations of the province.

Central Provinces.

In the Central Provinces there was an increase of 5,568 in the total vaccinations as compared with the results of the previous year, the number having increased from 457,678 in 1890–91 to 463,246 in 1891–92. Of these, 414,259 were primary operations, with a percentage of success of 96·24. The successful vaccinations in children born during the year numbered 250,637, and in children between one and six years, 131,054. Estimating the births at 40 per 1,000 of population, 56·8 per cent. were protected against small-pox; and the number of persons who were protected per 1,000 of the population was 39·64. "Considering the sparseness of the population," the Sanitary Commissioner remarks, "that it is very scattered, and that the physical "difficulties to be overcome by the vaccinators are very great in all districts, the "results obtained in this department are satisfactory; and I should add that this "success is largely due to the personal inspection of Civil Surgeons in their cold "weather tours in their respective districts." Arm to arm vaccination was maintained in most of the districts throughout the year, but experiments were made in the cultivation of animal lymph at Pachmari, and having proved successful, a further and more extended trial was sanctioned, "with the view to place in the hands of every "vaccinator in the province a sufficient quantity of animal lymph with which to "begin the operations of the coming season." During the year the introduction of

the Vaccination Act into the municipalities of Nagpur, Narsinghpur, and Harda was sanctioned.

Madras. The vaccination work done in the Madras Presidency during 1891–92 was very satisfactory, and showed an improvement of 92,860 on the operations of the previous year, the total number having risen from 960,560 to 1,053,420. Of these 996,274 were primary cases with a percentage of success of 93·1, or 1·5 less than in 1890–91. Satisfactory, however, as the year's work was, there is still much room for improvement, as shown by the facts that only 210,652 of the 924,238 recorded births of the year were protected, and only 31·43 per 1,000 of the population. The increase in vaccinations was contributed by all the districts but three (Trichinopoly, Kurnool and Coimbatore), chief among them being Tinnevelly with an excess of 12,973, South Arcot 10,322, and Godavari 10,301. Out of the total of 56 municipal towns of the Presidency vaccination was compulsory in 48, in nine of which it was introduced during the year under notice. Animal lymph was employed to a more or less extent in all the districts and municipalities of the Presidency, and the number of operations performed with all kinds of the lymph was 674,148, showing the satisfactory increase of 341,563 on the previous year, and of these 90·4 per cent. were successful. It will thus be seen that more than two-thirds of the total vaccinations in the Presidency as against two-fifths in 1890–91 were performed with animal lymph, which, under the orders of the Government, will be the only medium employed in future. The best results were obtained with lymph direct from the calf (96·4 per cent.), next with preserved animal lymph (93·5 per cent.), and the lowest (89·3) with lanoline paste, which has since been discontinued.

Bombay. Very satisfactory progress was also made in vaccination work in the Bombay Presidency during 1891–92. The total number of persons vaccinated was 893·147, an increase of 63,079 on the operations of 1890–91. The increase was spread over all the districts and circles except Baroda, which showed a decrease of 876. The year's work included 830,873 primary vaccinations with a percentage of success of 94·88. The Sanitary Commissioner estimates that 76·58 per cent. of the children available for vaccination were protected. This calculation is based on the recorded births of the year, which are doubtless much below the actual number. Reckoning the births at 40 per 1,000 of population the percentage of success is reduced to 58·4. Of children between one and six years 171,075 were protected. Animal lymph was in use throughout the year in Bombay City and several other places. In many villages of the Poona district the people provided either a calf or the money necessary to provide one, and they much appreciated animal lymph as it does away with the necessity of lymph being taken from their children's arms. So long as fresh animal or human lymph is available the Sanitary Commissioner deprecates using it in a diluted state, no matter with what material it may be mixed as a vehicle. As regards the quality of the vaccination work, Dr. McRury states that it has improved vastly of late, "in fact, wherever animal lymph is used it could not be better, especially when "the system of multiple vesicles is carefully carried out, as in the larger towns of the "Southern and Central Registration districts and in the City of Bombay."

Berar. The vaccination returns of Berar showed the satisfactory increase of 14,694 operations as compared with the results of the previous year, the total having risen from 114,162 in 1890–91 to 128,856 in 1891–92. Vaccination in Berar, the Sanitary Commissioner observes, has come to that point when fluctuations in the number of primary operations will mainly depend upon prosperous seasons or the reverse, as they affect the fecundity of the people. Of the total vaccinations 98,403 were primary cases with a percentage of success of 95·2, a result which is all the more satisfactory as it was verified by inspection. Good work was done in the protection of the infantile population, for out of every 100 persons successfully vaccinated 82·7 per cent. were infants and 16 per cent. were children between one and six years of age. "The percentage "of success attained in the vaccination of the infant population" (82·3 per cent. of "births exclusive of deaths), the Resident observes in his Order on the Vaccination Returns of Berar, "is very high, and is a proof that the vaccinators have done their "work efficiently during the year, and that the people themselves have learnt to "recognise the benefits of vaccination. Moreover, the satisfaction of feeling that the "protection of this, the most susceptible portion of the population is fairly complete, "is enhanced by the knowledge that there cannot be many children remaining "unvaccinated in Berar." Animal lymph was used exclusively during the year. There was little difficulty in obtaining calves or young buffaloes, and no opposition in the way of religious prejudice was met with.

VI.—MEDICAL INSTITUTIONS.

Civil Hospitals and Dispensaries.

The following comparative statement shows the number of hospitals and dispensaries open in the several provinces of India during 1891 and the previous year, and the number of patients under treatment:—

Provinces, &c.		Number of Institutions.	Number of In-door Patients.	Number of Out-door Patients.	Total Number of Patients.
Bengal	1891	272	35,859	1,460,195	1,496,054
	1890	265	29,660	1,239,850	1,269,510
Calcutta and Howrah	1891	11	25,318	219,818	245,136
	1890	7	24,362	208,073	232,435
North-Western Provinces and Oudh	1891	299*	54,372	3,012,662	3,067,034
	1890	295*	52,566	2,837,803	2,890,369
Punjab	1891	228	49,700	2,541,753	2,591,453
	1890	216	48,147	2,532,349	2,580,496
Burma	1891	80	28,603	392,190	420,793
	1890	74	23,125	339,088	362,213
Central Provinces	1891	111	8,222	904,654	912,876
	1890	107	7,885	867,219	875,104
Assam	1891	74	4,455	322,391	326,846
	1890	69	3,704	261,723	265,427
Coorg	1891	4	858	22,327	23,185
	1890	4	567	21,554	22,121
Madras	1891	432	51,730	2,807,532	2,859,262
	1890	415†	47,739	2,663,418	2,711,157
Bombay	1891	254	43,936	1,798,294	1,842,230
	1890	248	38,512	1,685,072	1,723,584
Berar	1891	44	3,537	279,214	282,751
	1890	44	3,075	274,195	277,270
Total	1891	1,809	306,590	13,761,030	14,067,620
	1890	1,744	279,342	12,930,344	13,209,686

* Statistics were furnished for only 271 in 1890 and for 274 in 1891.
† Statistics were furnished for only 406.

Bengal. The returns of the charitable dispensaries in Bengal for 1891 show an increase both in the number of institutions and in the number of patients under treatment in them. The total number of dispensaries at work during 1891 in Bengal, exclusive of Calcutta, was 272, an increase of 7 on the number of the previous year. At these there were 1,496,054 patients under treatment, 35,859 being in-door, and 1,460,195 out-door patients, against 29,660 and 1,239,850 respectively in the previous year. This shows a total increase of 226,544, which was attributed partly to the opening of new dispensaries and partly to the increasing popularity of the institutions. Besides the 272 dispensaries eight more had been established, but were not at work during the year under notice. That there is still room for improvement is shown by the fact that only 21·5 per 1,000 of the population resorted to these institutions, while in the North-Western Provinces and Oudh and in the Punjab the proportions were 65 and 125 per 1,000 respectively. There was a satisfactory increase in the number both of women and children, though the number treated as in-door patients was still comparatively small. "The importance of the separate treatment of female patients has," Dr. Hilson reports, "been urged continually on the medical officers at my inspection, and measures

" have in many cases been taken to effect the object by the construction of suitable " accommodation." A still larger increase is expected from the adoption of cottage hospitals, a standard plan of which had been supplied to all civil surgeons. As already stated, the year 1891 was an unhealthy one in Bengal, and this was indicated not only by an increase of cases of malarial fever but also of cholera cases, the latter disease having prevailed epidemically in many districts during the year. More patients were also treated for all other diseases than in 1890, which, to a great extent was attributed to the fact that the dispensaries are on the whole gaining in popularity and are being more largely resorted to. Among the in-door patients there were 4,776 deaths, being in the ratio of 133·1 per 1,000 of total treated, against a death-rate of 128·5 per 1,000 in 1890. Great attention is paid in these institutions to surgery, and during the year 8,074 major operations were performed against 6,344 in 1890; of these 163 terminated fatally. Operations for cataract also increased from 1,686 to 2,159, a further instance of the appreciation of the relief afforded at these institutions. Several medical officers and their subordinates, the Inspector-General states, are now taking a greater interest in this important branch of their profession. The Lieutenant-Governor agreed with the Inspector General " in attaching much importance to this class of operations, as " the restoration of sight must necessarily gain for the successful operator the confidence " of the people in whose midst he is situated, and must consequently produce an " increase in the attendance at his dispensary."

The following statement shows the number of in-door and out-door patients treated in the several hospitals and dispensaries in Calcutta during the last two years:—

Name of Institutions.	1891.				1890.			
	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.
Medical College Hospital - - -	6,803	56,227	63,030	100·7	6,741	52,108	58,849	92·6
Presidency General Hospital - - -	2,928†	—	2,928	43·3	3,105	—	3,105	36·0
Campbell Hospital - - - -	9,088‡	—	9,088	188·2	8,415	—	8,415	202·9
Police Hospital - - - - -	2,468§	—	2,468	9·7	2,593	—	2,593	8·0
Mayo Native Hospital - - - -	1,884	28,700	30,584	156·5	1,814	27,976	29,790	124·5
Chandney Hospital - - - -	391	42,998	43,389	25·5	326	40,176	40,502	39·8
Park Street Dispensary - - -	—	29,901	29,901	—	—	29,300	29,300	—
Chitpore Dispensary - - - -	—	22,262	22,262	—	—	19,777	19,777	—
Sukea's Street Dispensary - - -	—	18,589	18,589	—	—	17,620	17,620	—
Bhawanipur Dispensary - - -	—	10,884	10,884	—	—	10,694	10,694	—
Total Calcutta Hospitals and Dispensaries	23,562	209,561	233,123	121·5*	22,994	197,651	220,645	118·3*
Howrah General Hospital - - -	1,756	10,257	12,013	211·2	1,368	10,422	11,790	220·2
Grand Total - -	25,318	219,818	245,136	127·8	24,362	208,073	232,435	124·1

* Reckoned on cases treated exclusive of those treated in the ophthalmic ward of the Medical College Hospital.
† Exclusive of 214 cases of no appreciable diseases.
‡ " 39 " "
§ " 20 " "

It will be seen that there was an increase in both classes of patients in all the hospitals but the Presidency General and Police Hospitals. The death-rate among the in-patients was 127·8 per 1,000, or 3½ per 1,000 more than in 1890. Cholera patients rose from 528 to 761, and the fatal cases from 291 to 455, which accords with the increased prevalence of the disease among the general population. On the other hand, there was great decrease of small-pox cases from 321 to 21, all of which were treated in the Campbell Hospital. Dysentery and diarrhœa were also more prevalent than in the previous year, while the number of cases of malarial fever was somewhat less, being 4,235 against 4,366. There were 2,221 important surgical operations performed against 2,080 in 1890, and among them there were 107 deaths being in the ratio of 45 per 1,000, against a ratio of 39 in 1890.

Punjab.

Twelve new dispensaries were opened in the Punjab during 1891, bringing the total number of charitable institutions at work in that year up to 228. At these, 2,591,453 patients were under treatment, being an increase of 10,957 on the number of 1890. The increase was entirely due to the opening of the new dispensaries, as there was a considerable decrease on the number treated at the institutions which existed in 1890, when there was an abnormal increase owing chiefly to the great unhealthiness of the season. Calculated on the approximate population of the province, the number of patients yielded a percentage of 12·5. Of the diseases for which patients sought relief there were 3,988 cases of cholera, being an increase of 1,286 over 1890. Special medical aid was sent, it is stated, to the districts most affected. Cases of malarial fever declined from 580,273 to 421,677, which was due to the healthiness of the year, " but the returns show," the Inspector-General observes, " that the malarial influences prevailing in 1890

" left their mark in 1891 by an increased attendance of 11,050 cases of scurvy, of 4,063 " of debility, of 13,368 of diseases of the digestive system, of 5,474 cases of spleen, and " 18,369 of ulcer." Diseases of the eye showed an increase of 17,705 cases over 1890, the number treated in 1891 being 251,379. Among the in-patients there were 2,678 deaths during the year, being in the ratio of 53·9 per 1,000 of average strength against a death-rate of 54·5 in 1890. In surgical work there was an increase in minor operations from 171,126 to 185,120, and in those of a major kind from 11,105 to 13,736. Including those remaining from the previous year, the latter numbered 14,054. Among these there were 4,622 cases of cataract, of which 3,864 or 83·6 per cent. resulted in cure.

North-Western Provinces and Oudh.

During 1890 there were five new dispensaries opened in the North-Western Provinces and Oudh, and one was closed, the total at the end of the year being 299. Statistics, however, were furnished for only 274, at which the total number of patients treated was 3,067,634 against 2,890,369 in the previous year. Of the patients treated 625,456 were women and 750,832 were children, both showing a marked increase on the figures of the previous year, which were 513,254 and 630,765 respectively. The in-door patients numbered 54,372, as compared with 52,566 in 1890, and among them there were 3,357 deaths, giving a death-rate of 61·7 per 1,000 against 3,089 or 58·7 in the previous year. The increase in the mortality was attributed to the fresh cases being of a more serious nature than those admitted in the previous year. Of the diseases for which the patients were treated 530,961 were suffering from malarial fevers, a decrease of 17,976 on the number of 1890; of cases of cholera there were 8,502 against 7,423, and cases of diseases of the eye also increased from 218,468 to 241,942. The number of surgical cases rose from 141,950 to 154,963. These included 23,321 major operations, of which 17,745 resulted in cure and 330 were fatal. The new dispensaries accounted for 68,503 of the total increase of patients.

Burma.

The same 35 dispensaries were in operation in Lower Burma in 1891 as in the previous year, but the attendance increased from 262,801 to 284,349. Of the total patients, 140,172, or nearly half, were Burmese, which shows the growing popularity of these institutions. Indoor patients increased from 17,421 to 20,028, and of these 11,821 were cured and 1,248 or 60·0 per 1,000 died against 1,511 deaths or 86·8 per 1,000 in 1890. The year's work showed an increase in the number both of major and minor operations performed, the former having risen from 277 to 337, and the latter from 6,842 to 7,618.

During the year 45 dispensaries were in operation in Upper Burma, being an increase of six as compared with 1890, and the number of patients who attended them amounted to 136,444, or 37,002 more than in the previous year. Of the total 8,575 were in-patients, and 127,869 were out-patients. The Burmese resort to these institutions in considerable numbers, the proportion being 61·7 per cent. of the total. One hundred and five major and 2,162 minor operations were performed during the year.

Central Provinces.

There were 111 hospitals and dispensaries at work in the Central Provinces during 1891, or four more than in the previous year; and the total number of patients rose from 875,104 to 912,876. The increase extended to both in and out door patients, the former having risen from 7,885 to 8,222, and the latter from 867,219 to 904,654. Among the in-patients there were 977 deaths or 118·8 per 1,000, a ratio higher by 18 per 1,000 than that of 1890. The high mortality was greatly due to many of the patients being beggars and poverty-stricken wanderers from adjoining provinces who were taken to hospital by the police in a moribund condition. There were 22,472 surgical operations performed against 18,656 in 1890. Malarial fever cases were much fewer than in 1890, but in several groups of diseases there was a considerable increase. Cholera patients were greater by 219 per cent., and scurvy by 105; other diseases connected with bad or defective food were also more active and widespread.

Assam.

There were 74 dispensaries open in the province of Assam during 1891, an increase of five on the number of 1890. With this increase the total number of patients advanced from 265,427 to 326,846; that is, by nearly 17 per cent. In-patients increased from 3,704 to 4,455, and of these 2,433 were cured and 836 died, the latter being equal to 187·6 per 1,000 against a death-rate of 190·3 in the previous year. Out of the total number of patients malarial fever and diseases of the skin accounted for 138,091. Next in order came other diseases of the digestive system, dyspepsia, ulcers, dysentery, and spleen diseases. The number of major operations performed rose from

652 in 1890 to 732, and of minor operations from 6,321 to 7,728. The Chief Commissioner inspected every dispensary at district and sub-sectional headquarters in the plains, and was much struck with the improvement in their general appearance, equipment, and sanitary arrangements since he last inspected them in the cold season of 1886–7.

Madras. The total number of civil hospitals and dispensaries open in the Madras Presidency during 1891 was 432, or 17 more than in the previous year. At these 2,859,262 patients were under treatment, 51,730 being in-door and 2,807,532 out-door patients, both showing a considerable increase as compared with the previous year. Of the in-patients, 30,633 were cured and 4,395 died, the latter representing a ratio of 85 per 1,000 of the total against 64 in 1890. In nearly all the districts epidemics of a severe character had to be contended with. Most of the important diseases showed an increase of cases, especially cholera, from which 22,007 persons sought relief against 8,991 in 1890, small-pox cases also rose from 424 to 856, and venereal cases from 54,289 to 63,295. The increase of patients was attributed partly to the unhealthiness of the year, but chiefly to the larger number of institutions in operation, and to their growing popularity among the natives. The appreciation of the people of medical treatment on European methods is further shown in the number of surgical operations performed, which aggregated 105,382 against 90,165 in 1890. Of these, 6,932 were major operations, being an increase of 627 on the previous year. It is noticed that during the three years 1888 to 1891 the number of midwives in the employment of District and Taluk Boards and Municipalities have increased from 157 to 208, and that during the same period the number of labour cases attended by them have nearly doubled, having risen from 6,086 to 11,703.

At the Madras Voluntary Venereal Hospital 442 patients were under treatment or 25 more than in 1890. A great number of them (219) were admitted for syphilis. It is reported that the patients, some of whom were children, only came to hospital when in a very advanced stage of disease. The returns, however, were looked upon as satisfactory, as the "keeping such bad cases off the town must have been " advantageous to both the military and civil population."

Bombay. In the Bombay Presidency 254 civil hospitals and dispensaries were at work during 1891, an increase of six on the number of the previous year. The total number of patients treated was 1,842,230 (1,798,294 out-door and 43,936 in-door) against 1,723,584 (1,685,072 out-door and 38,512 in-door) in 1890, showing again an increase under each head. Of the in-patients, 26,380 were cured, 5,668 relieved, 5,229 discharged otherwise, and 3,013 died. The ratio of deaths on the total inmates was thus 68 per 1,000 against 67 in the previous year. Malarial fevers continued to head the list of diseases from which relief was sought, and the number of cases rose from 288,919 in 1890 to 324,536; cholera gave 2,205 cases, as compared with 691, and there was an increase of 271 cases of dysentery and 2,207 of diarrhœa. Patients suffering from venereal diseases increased from 33,459 to 36,037. The Surgeon-General with the Government of Bombay reports a steady increase in the admissions from these diseases in the civil hospitals of Bombay City. "The type of the disease," he says, " has also changed in its severity and virulence. I think it may fairly be inferred that " the increase in numbers and virulence of these diseases has resulted from the " abolition of the Contagious Diseases Act in the city of Bombay." Including the 129 surgical cases which remained under treatment from the previous year, the total major operations numbered 5,972, of which the largest number was in connexion with the eye. In the course of the year 4,929 of the cases were cured, 288 relieved, 79 discharged otherwise, and 173 ended fatally, leaving 134 still in hospital at the end of the year. The minor operations aggregated 87,682 against 81,872 in 1890.

Berar. The same 44 dispensaries were open in Berar in 1891 as in the previous year. The number of in-patients was 3,537, and of out-patients 279,214, being an increase of 462 and 5,019 respectively compared with the figures of the previous year. The increased attendance was due in a great measure to the unhealthiness of the season as shown by the rise in the death-rate of the province from 35·4 per 1,000 of population to 40·6. Of the in-patients, 2,984 were cured and 208 died, which gives a death-rate of 58 per 1,000 of total treated against 46 in 1890. The increase in mortality was attributed to the hopeless condition in which most of those who died were received into hospital. Out of 148 deaths in the 36 charitable dispensaries, 26 died within 24 hours of date of admission. Of the diseases under

treatment malarial fevers again made up the largest proportion of patients. Diseases of the eye also appeared to be a source of general suffering. Cholera prevailed in an epidemic form, and the number of cases treated rose from 68 in 1890 to 2,293. There was also a considerable increase under dysentery and diarrhœa. There were 242 major and 9,360 minor surgical operations performed as against 142 and 9,971 respectively in 1890.

Lunatic Asylums.

Bengal.

At the five asylums in Bengal 1,234 lunatics, including 213 fresh admissions and re-admissions, were under treatment in 1891, being an increase of 26 on the number of the previous year. In the course of the year 149 patients were discharged as cured, and 42 otherwise, and 80 died. Compared with the figures of 1890 the admissions were fewer by eight, and the discharges and deaths together were greater by 84, with the result that at the end of the year there were 963 persons under detention, or 58 less than at the close of 1890. The criminal population of the asylums showed a decrease of 16, the number in confinement having fallen from 465 to 449, which was generally attributed to the effect of the rules laid down by the committee in 1888, which were coming into full operation, and by which lunatics of this class are now discharged after recovery. The health of the inmates of the asylums was again remarkably good. There was no serious epidemic of any disease except 28 cases of influenza at Patna and 39 cases at Berhampore. The whole of the latter were confined to women, while in the previous year only males suffered. The deaths in the asylums rose from 69 or 69·4 per 1,000 of average strength in 1890 to 80 or 80·2. Of these 1 was due to cholera, 17 to dysentery and diarrhœa, 10 to general debility and old age, 18 to tubercle of the lungs, 7 to pneumonia, and 4 to anæmia. Of the alleged causes of insanity 481 cases were under treatment during the year for physical causes, and 156 for moral causes, 90 of the latter arising from grief.

In the Bhowanipore Asylum, containing European and Eurasian patients only, the population was 50, or two more than in 1890. This number was reduced at the end of the year to 35, three persons having been discharged as cured, one despatched to Europe under the Merchant Shipping Act, one transferred to the care of friends, two made over to the military authorities, one despatched to Europe as still insane, and seven having died. The general health of the patients was good, there was no epidemic visitation of any kind. The question of closing this asylum altogether, and transferring the patients to the Dalanda block of buildings was under consideration, and had since been referred to a special committee.

North-Western Provinces and Oudh.

The daily average population of the four lunatic asylums (Agra, Bareilly, Benares, and Lucknow) in the North-Western Provinces and Oudh during 1891 was 1,007, or 7 less than in the previous year. The new admissions increased from 254 in 1890 to 277. In the course of the year 184 lunatics were discharged, of whom 119 were reported as cured, 87 died, and 1 escaped. Except for an outbreak of cholera at Benares, causing eight deaths, the year was exceptionally healthy, the death-rate standing at 86·4 per 1,000 against 90·8 in 1890. Of the total 87 deaths diseases of the respiratory organs accounted for 21, and anæmia and debility 19. The dairy which was started at Bareilly at the close of the previous year is reported to have proved an unqualified success. During the year arrangements were made at Bareilly to purchase grain when the market was low, and store it for future consumption. This resulted not only in a saving to Government but in an improvement in the health of the patients, owing to the possibility thus afforded of giving them a more liberal diet.

Punjab.

The total number of lunatics under treatment in the two asylums (Delhi and Lahore) in the Punjab during 1891 was 432, of whom 110 were fresh cases, and 5 were re-admissions. The discharges from all causes numbered 92, and of these 41 were cured, and 10 patients in improved health and 5 unimproved were made over to their friends. By the end of the year there remained under treatment 340 patients, an increase of 23 over the population at the same date in 1890. Of the total number of inmates of the asylums 74 were criminal lunatics, 23 of whom were admitted during the year. There was more sickness among the patients than in 1890, but the increase was almost entirely confined to the Lahore Asylum, where, however, the deaths fell from 27, or 115·3 per 1,000 of average strength, to 22, or 93·2. Of these the Inspector-General reports, 5 were admitted in a very bad state of health and died

within the year, and most of the others were chronic cases of disease occurring in debilitated subjects. At Delhi the deaths rose from 7 or 75·2 per 1,000 to 12 or 130·2. Here an epidemic of influenza in June accounted for 6 deaths, and pneumonia for 4 out of 10 cases. The Inspector-General again called attention to the defective construction and arrangements in the Lahore Asylum, but it appears that want of funds stands in the way of establishing a new asylum elsewhere.

Burma. During 1891 there were 335 lunatics in the Rangoon Asylum, including 84 fresh admissions, of whom only 45 were Burmese. At the close of the year the number of inmates had decreased to 254 by the discharge of 59 (35 as cured) and the death of 22. The general health of the patients was good. The admissions to hospital declined from 136 to 75 in the previous year, and the deaths from 40 or 154·1 per 1,000 of average strength to 22 or 80·5. There was no overcrowding on the civil side of the asylum, but, as in 1890, the asylum was overcrowded on the criminal side, and the number of criminal lunatics that had to be confined in the Rangoon jail for want of proper accommodation in the asylum increased steadily. The Inspector-General says when the new asylum is opened in Mandalay there will be ample accommodation in the province.

Central Provinces. The returns of the Nagpur and Jubbulpore asylums in the Central Provinces for 1891–92 show that the number of lunatics under treatment during the year was 317, or nine more than in 1890. Of these 58 were fresh admissions. There was no overcrowding at either institution, and at both the health of the patients was fairly good. Owing to the absence of influenza, which was prevalent in 1890, there was less sickness than in the preceding year. In the Nagpur asylum the admissions to hospital fell from 148 to 96, but in the Jubbulpore asylum, owing chiefly to an increase of fever cases, there was a slight rise in the admissions from 62 to 67. In the course of the year 33 patients were discharged, 25 as cured, and 23 died, so that the year closed with an asylum population of 261. Of the 23 deaths Nagpur recorded eight, which represented a mortality rate of 62·9 per 1,000 of average strength, identically the same as in 1890, while at Jubbulpore there were 15 deaths or 112·1 per 1,000 against 13 or 99·4. During the year various structural improvements were either carried out or in progress in both asylums, and at Nagpur, the improvement of the water-supply also received attention.

Assam. The total number of patients under treatment in the Tezpur lunatic asylum during 1891 was 167, being an increase of 23 on the previous year. Of these 42 were new admissions and 7 were re-admissions. Before the close of the year 36 had been discharged, 17 as cured, 18 died, and 2 escaped, leaving 111 still in the asylum at the end of the year. Both sickness and mortality were unusually high among the patients. The deaths were just double the number of the previous year, and the high rate of mortality (150 per 1,000 against 81) was attributed to the state of health on admission, the bad state of health of most of the lunatics at the commencement of the year (the year being unusually unhealthy) and to an epidemic of cholera in September, from which there were 13 cases and 5 deaths. Dysentery and pneumonia accounted for nine of the remaining deaths. The Sanitary Commissioner of the province reported well of the sanitary condition of the asylum, and recommended, as it was continuing to grow in size, that the well-water be filtered in regular filtering beds with a distribution tank attached, as is done in the Tezpur jail. He thought that the complete disuse of the tank water, which was blamed for the outbreak of cholera, would go far to prevent a recurrence of the disease. In view, however, of the more important requirements of the asylum, the Chief Commissioner thought that the proposal might stand over for the present, especially as the well from which the water-supply is obtained is a good one.

Madras. The total population of the three asylums in the Madras Presidency (Madras, Calicut, and Waltair) during 1891 was 810, of whom 211 were fresh cases and two were re-admissions. Of the total 61 were cured, 43 were discharged or transferred to the care of friends, and 114 died, leaving 592 patients at the close of the year. The general health of the asylums was again unsatisfactory, and the number of deaths (114) was the same as in the previous year. In the asylums of Calicut and Waltair, the mortality showed a decrease as compared with 1890, but in Madras the increase was so large, viz., from 187·0 per 1,000 of average strength to 230·9 as to more than counterbalance the favourable figures for the other two asylums, and to raise the average death-rate (185·7 per 1,000) to a higher figure than any recorded during the previous decade. In the Madras asylum the number of deaths rose from 81 in

1890 to 97, and of these 45 were due to dysentery and diarrhœa, and 8 to cholera. But although the mortality in this asylum was higher, and the year generally unhealthy, and the ratio of admissions to hospital abnormally high, the average daily sick (16) was much lower, an anomaly which the Superintendent attributed to the nature of the sickness, the cases being either rapidly fatal or cured and discharged within a short period. The causes of insanity were traced in 79·34 per cent. of the 213 fresh admissions, a marked improvement on previous years, and was due to increased attention bestowed on the subject. Dementia and mania were the most common forms of insanity under treatment, and contributed 417 and 228 cases respectively. The criminal lunatics numbered 171, of whom 34 were admitted during 1891. By the close of the year this number was reduced to 147 by the discharge or transfer of 15 and the death of 9.

In the six lunatic asylums of the Bombay Presidency there were 961 inmates during 1891, of whom 252 were new admissions and 19 were re-admissions. In the course of the year 182 patients were discharged, 90 as cured, and 70 died, leaving 709 in the asylums at the end of the year. The inmates were more healthy than in 1890, and the death-rate declined from 110 per 1,000 to 98 per 1,000 of average strength. Of the 70 deaths 18 were from dysentery, 12 from diarrhœa, 7 from debility, 6 from old age, and 4 from pneumonia. The cause of insanity was ascertained only in 488 cases, and of these 392 were attributed to physical and 96 to moral causes. The abuse of spirits and use of intoxicating drugs was alleged as the cause of more than a half (203 of the former). Fever was the cause given in 35 cases, epilepsy in 26, previous attack in 21, and destitution in 20; and of moral causes 67 cases were attributed to grief. Of the 961 lunatics, 132 belonged to the criminal class, or 3 less than in 1890, and of these 30 were new admissions. By the discharge of 16 as cured and 4 as otherwise, and the death of 6, there remained at the end of the year 106 inmates of the criminal class under confinement. Bombay.

Medical Schools.

The number of medical schools open in Bengal during 1891-92 was 10, of which five were maintained by Government, and five were unaided. The Government Medical College, Calcutta, is affiliated to the University, and prepares candidates for its various medical degrees. The four other Government medical schools follow a lower course, through the medium of the vernacular, and grant licenses for practice to deserving students. Of the unaided schools, four are schools for teaching homœopathy, and one closely resembles the Campbell Medical at Sealdah, in its course of studies. The total number of pupils attending the various medical schools rose from 1,184 in 1890–91 to 1,290 in 1891-92, the increase being attributed to the opening during the latter year of the School of Homœopathy in Calcutta. Bengal.

On the opening of the session in the Calcutta Medical College, 197 students resumed their studies, five rejoined, and 120 new students were admitted, making a total of 322, against 281 in the previous year. The strength of the College at the close of the session was reduced to 251, 71 of the students having left it after passing their examination or owing to other causes. As regards the examinations, 57 candidates (including 1 female) passed the Preliminary Scientific L.M.S. examination; 24 (including 1 female) passed the First L.M.S.; 20 passed the Second L.M.S. (17 (including 1 female) passed the Preliminary Scientific M.B.; 11 (including 1 female) passed the First M.B.; 4 passed the Second M.B.; and 2 passed in Honours in medicine. Twelve of the military students passed and left for regimental duties; 7 Native *dais* passed in midwifery from the Eden Hospital and received certificates of qualifications, and 13 pupil-nurses also passed as midwives.

The Campbell Medical School had 243 pupils on its rolls on the 31st March 1892. Out of 89 male and 9 female second-year students, 54 and 7 respectively passed the first license examination. For the second or final license examination there were 49 candidates, including 4 females, and of these, 42 male students were awarded diplomas, and 3 of the 4 females were declared to have passed. In the first-year class there were 69 male and 12 female students, of whom 58 and 7 respectively were promoted to the second-year class. In the compounder class there were 50 male and 2 females. As regards the entrance qualifications of the students, the Superintendent reported: "There has been a gradual increase in the number of students who possess the higher "entrance qualifications, and a decrease in the number of those possessing the middle "vernacular scholarship examination certificates. The largest number of female

" students possess the Campbell Medical School entrance examination certificates. " One of them, possessing the upper primary scholarship examination certificate, was a " Muhammadan. She is the first Muhammadan girl who has sought admission into " the School."

At the Dacca Medical School there were 161 pupils on the rolls, 4 being in the fourth-year class, 42 in the third-year class, 53 in the second-year class, and 62 in the first-year class. Thirty-six students passed the final examination, and obtained the diploma and the title of Civil Hospital Assistant; and 37 students of the second-year class passed the junior diploma examination and were promoted to the third-year class.

The Temple Medical School, Patna, had 127 students on its rolls, a falling off of 30 compared with the previous year, which was attributed to English being made a compulsory test for admission. Out of 36 students who competed for the second license examination 17 passed; and 27 pupils passed the first license examination out of 38 who attended it. The compounder class consisted of 16 pupils. This class is reported to be much appreciated by the public, and is frequently called upon to supply passed compounders to dispensaries in the neighbouring districts.

At the Cuttack Medical School there were altogether 66 pupils on the 31st March 1892. All the 25 third-year pupils passed the final examination and received diplomas, and of the 22 pupils of the second-year class, 21 were promoted to the third-year class. The Inspector-General of Hospitals, who visited the school during the year, testified to the progress it was making.

Good work is also being done in the diffusion of medical knowledge among the people of Bengal by private enterprise. There are five unaided medical schools, two at Dacca and three at Calcutta, four of which teach homœopathy.

North-Western Provinces and Oudh.

The number of pupils of the various classes which compose the Agra Medcal School who presented themselves for examination in 1891–92 was 216, or 3 less than in the previous year. Of these 51 were females, being an increase of 13 on the number of 1890–91. The extension to private pupils of the middle class qualification for entrance which took effect from the commencement of the year is reported to have caused little or no difficulty in obtaining pupils for the school as the number in the lowest class (IV.) of the male division was 42, as compared with 37 in 1890–91. The results of the examinations showed a general improvement in the attainment of the pupils. In Class I., or the final class, there were only 7 failures out of 60 candidates. The results of the work of the female pupils were also encouraging. Three out of 4 pupils in the first class obtained diplomas. The second and fourth classes did well. In the third class there was a considerable falling off; the students were considered in the previous year to be of inferior ability, and it was to be expected that their averages would compare unfavourably with those gained in 1890–91 by the present second class. Efforts were being made by the Dufferin Association to assist girls desirous of entering the Agra Medical School by giving five scholarships during their previous school training to girls who are willing to be educated up to the Middle English standard, and to engage to serve the Association for a fixed time after leaving the school; but the several schools interested had taken little advantage of the offer of these scholarships. The tuitional staff of the school has been strengthened by the appointment of a highly qualified officer to be the Chemical Examiner to the Provinces, who will also lecture on chemistry in the school.

Punjab.

The total number of students at the Lahore Medical College and School during 1891–92 was 322 against 297 in the previous year. Of these 144 (including 6 females) were in the College Class, and 178 (including 10 females) were in the Medical School. Of late years the College has developed very rapidly. In 1887–88 the number of students was 61, and in 1891–92 they had increased to 144. There has also been a satisfactory increase in free students. During the same period they have risen from 18 to 79. "These figures," the Inspector General of Civil Hospitals observes, " indicate that licentiates in medicine and surgery find yearly more openings for " following their professions outside Government service." The results of the examinations were on the whole satisfactory. For the L.M.S. diploma of the University 19 candidates presented themselves for examination, and of these 8 or 42 per cent. passed. This is an improvement on the results of the previous year, when at the same examination 38 per cent. of the candidates were successful. Ten out of the 19 candidates were examined for the first time and 6 were successful. All the remaining 9 candidates had failed at the previous examination. At the junior examination 26 (including 1 female) out of 39 candidates obtained qualifying marks, 2 having passed the first M.B. examination. In the Hospital Assistant Class of the

School 53 candidates were examined, and 39 (including 1 female) or 73·6 per cent. passed, against a percentage of 59 in 1890–91.

Madras. The total strength of the Madras Medical College during 1891–92 was 487, being an increase of 75 on the attendance of the previous year. Of these 41 were female students against 47 in 1890–91. In the Hospital Assistant Department, consisting of 254 pupils, 36 appeared for the final examination and 30 passed. The results of the several University examinations were highly satisfactory, the percentage of successful candidates being almost double that of the previous year. At the first L.M.S. examination there were 83 candidates, of whom 38 passed; and 15 out of 21 candidates passed the second L.M.S. examination. At the Preliminary Scientific examination 2 out of 10 passed. Of 6 candidates who appeared for the first M.B. and C.M. examination 4 passed, and all the 3 candidates who went up for the second M.B. and C.M. examination were successful. During the session 4 Dufferin Scholarships (2 Apothecary and 2 Hospital Assistant) were awarded.

The Board Medical School, Nellore, had 20 pupils (including 3 Mohammedans) on its rolls. Six stipendiaries went up for the final examination for the Hospital Assistant grade and all passed, one of them taking a place in the first class. At the Prince of Wales' Medical School, Tanjore, there were 27 pupils, 10 of whom were Native Christians, 5 Brahmans, and the remainder non-Brahman Hindus. Eleven of the pupils were being prepared for the Hospital Assistant grade.

Bombay. The attendance at the Grant Medical College, Bombay, rose from 203 in 1890 to 222 (including 26 females) in 1891. For the first University examination in medicine there were 67 candidates, of whom only 20 were successful; and for the second examination in medicine only 21 passed out of 76 candidates. The Principal of the College reported that in both of these examinations the greater proportion of the candidates had been rejected on previous occasions. Those who passed on the first attempt numbered 11 and 17 respectively. For the L.M.S. examination there were 49 candidates, and 22 were successful. Of these 9, all new candidates, were in the first class, 2 of them being women, who came out first and second in order of merit. In the midwife class 4 soldier's wives underwent the usual course of instruction in nursing and midwifery, and were found qualified for the diploma.

The Government Medical Schools at Poona, Ahmedabad and Hyderabad, were working satisfactorily. The number of students was 208, and of these 47 passed the third year examination.

VII.—SANITARY WORKS.

Civil.

Bengal. Praiseworthy progress was made during 1891 in improving the sanitary condition of Calcutta. The extension of the water-supply was vigorously carried on; 581 stand-posts for filtered water were erected, and 36·36 miles of pipes laid, besides 3·7 miles of pipes, and 85 hydrants for unfiltered water. At the close of the year the daily supply of water had reached 19 million gallons of filtered and $4\frac{1}{4}$ million gallons of unfiltered water, giving a daily average per head of population in the town of 35·93 gallons of filtered water, and in the suburbs of 15·11 gallons, besides an additional supply of 10 gallons per head of unfiltered water in the town for bathing and cleansing purposes. During the year, 1,439 premises were connected with the filtered supply, bringing the total up to 21,280, and the unfiltered connections amounted to 560, of which 81 were made in the course of the year. The drainage system of the town proper was practically completed some time ago, and the length of pipe sewers now open is 200 miles. Sewer construction was extended by 2·6 miles of pipe sewers and 6·34 miles of channels of surface drainage. The drainage of the suburban area was engaging the attention of the Commissioners, who proposed to take in hand the surface drainage scheme first. The Lieutenant-Governor of Bengal trusted that this important matter would not be forgotten, "since there can "be no doubt that the higher death-rate in the suburbs is very largely due to the "unsystematic and inadequate drainage of that part of the municipality." In the structural improvement of bustees considerable energy was displayed, and nearly two lakhs of rupees were expended during the year under this head. The required improvements were carried out in eight bustees in the town, while improvements were in progress in eleven others. "The Commissioners," it is stated, "are pleased to be "able to record a better out-turn of work under this head than in any previous year "since the improvement was first taken in hand in 1882–83.

The municipalities of the interior of Bengal spent Rs. 13,37,569, or 42·85 per cent. of their income (Rs. 31,20,971), on sanitary works. No projects of any magnitude were carried out during the year, but among the more important items may be mentioned the drainage works at Serampore, the acquisition of land for general improvements in the 24-Pergunnahs district, the construction of waterworks at Nasirabad, the extension of the waterworks at Decca, improvement of drainage at Puri, and the survey of Patna town for drainage purposes. The Sanitary Commissioner reports favourably of the interest shown in the majority of the municipalities in sanitary matters. "There is, undoubtedly," he says, "a growing desire on the part "of the majority of Municipal Commissioners to do all they can for the benefit of "the towns committed to their care, and to give effect to simple and inexpensive "advice, and, as far as their limited means will allow, also to the larger principles "of modern science." In improving sanitation the District and Local Boards spent Rs. 49,217 on the sinking of wells, excavating tanks, and improving drainage channels; while on similar measures a sum of Rs. 1,51,046 was expended by private individuals, the most important work being the improvement of the Sivaganga tanks in Deoghur, at the expense (Rs. 12,000) of His Highness the Maharajah of Darbhanga.

The Sanitary Board held five formal meetings during the year, at which a good deal of useful work was done. Various schemes were considered, among them being the water-supply for Howrah and other municipalities, and the drainage of Jalpaiguri and Puri. A survey of the towns of Jamalpur and Pabna was also completed, and the work of preparing drainage projects was undertaken. With a view to encourage municipalities to take up drainage surveys, the Local Government purchased some survey instruments for the purpose of lending to them for a fee. The result of the experiment proved satisfactory, and in consequence of the instruments having been in constant use, it was in contemplation to provide a larger supply.

Punjab. Satisfactory progress was made in sanitary work in the Punjab during the year. The Peshawar and Abbottabad waterworks were completed and handed over to the respective municipalities. The Delhi waterworks were approaching completion. Water-supply schemes for Dalhousie, Kohat, and Murree were sanctioned and commenced. A similar scheme for Amritsar, to cost Rs. 12,25,000, had received sanction, and a project for increasing the water-supply of Simla had been prepared and forwarded to

the Government of India. Among the municipal drainage schemes, the works of Ludhiana were approaching completion. The drainage scheme for the town of Faridabad, in the Delhi district was in progress. Drainage works at Mozang, a suburb of Lahore, were begun, and the intramural drainage of Peshawar was in hand. The Gujranwala intramural drainage scheme was making good progress, and the Kohat drainage works were approaching completion. The main sewer at Simla was extended, and arrangements were being made for carrying it still further down the stream. Water-supply and drainage schemes for several other places were under consideration at the close of the year. "Everywhere throughout the Punjab," the Army Sanitary Commission remark, "there is more or less evidence that steady progress is being made." The expenditure incurred by the municipalities under the different items of sanitary work in the course of the year was Rs. 12,04,769, equal to about 30 per cent. of their income. The sum realised from the sale of manure and town sweeepings in the different municipalities continued to increase, and in 1891 amounted to Rs. 1,24,804 against Rs. 1,20,790 in 1890.

The Provincial Sanitary Board held six meetings during the year, and considered, amongst other business, the question of village sanitation, the condition of water-logged areas, the improvement of the registration of vital statistics, and also the draft of a Village Sanitation Act.

North-Western Provinces and Oudh.

Considerable progress was made in sanitary improvements in the North-Western Provinces and Oudh. The Sanitary Commissioner says: "A great advance in "sanitation in every direction is evinced in the record of the year, and the very "important and extensive works completed, in progress and initiated in these "provinces marks an era in the sanitation of Upper India." Among water-supply works the most important schemes undertaken or completed in 1891 were those at Allahabad, Benares, Cawnpore, Lucknow, and Naini Tal. The first of these was completed and opened by the Viceroy on the 26th March of the year under notice, and the inhabitants are said to appreciate its advantages. The water-supply schemes at Benares and Cawnpore were in progress, and the main lines of that for Lucknow were determined upon. At Naini Tal the scheme was taken in hand at an estimated cost of Rs. 40,000. Water-supply works were also constructed at Almora, in Kumaon district, and Haldwani, in Naini Tal district, at a cost of Rs. 50,000 and Rs. 57,000 respectively. Of the drainage schemes that for draining the important tract of country lying between the Burhganga and the east Kali Nadi, which had long suffered from water-logging, and which has now been practically reclaimed, was making rapid progress. The new drainage and sewerage project at Naini Tal was in hand. Much activity was also shown in the execution of minor sanitary works, on which the municipalities are reported to have spent a fair proportion of their income.

The Sanitary Board held three meetings during the year. The principal measures that received their attention were the preparation of programmes of the more pressing drainage works which in their opinion should be undertaken in the provinces during the next three years, drainage obstructions in the non-canal districts, the Village Sanitation Bill, and the provision of a maximum and minimum scale of conservancy establishments for municipalities.

Burma.

No new sanitary works of any importance were undertaken in Burma during 1891, but considerable sums were expended by many municipalities in minor works. The Shone drainage scheme was further extended in Rangoon, and was reported to be working satisfactorily. A scheme for the reclamation of low lands, and for the general improvement of the town, framed by the committee appointed for the purpose, was submitted to the Government of India, and since the close of the year had been approved. The Prome waterworks continued to give satisfaction, and a number of new hydrants were erected in private premises. The Public Works Department spent Rs. 1,28,484 in Lower Burma and Rs. 1,10,462 in Upper Burma on sanitary works. As regards village sanitation, the question is one, the Sanitary Commissioner states, "which demands more attention. There is too great a tendency to regard the matter "as hopeless, and therefore to abandon all attempts at improvement." Some advancement in this direction may however be expected, for he states further: "District "Medical Officers will in future be instructed to make brief notes on the sanitary "condition of the villages inspected by them during the year, and to incorporate them "with the district sanitary reports. Hitherto there has been no means of knowing "how many villages have been inspected by them, or of gauging accurately the "sanitary requirements of individual villages."

No very great progress was recorded by the Sanitary Board. Pending the appointment of a Sanitary Engineer, municipalities had been requested by the Board to furnish information of existing maps and a memorandum of the nature of drainage works, water-supply, and conservancy, which appeared to the local authorities necessary. The Board also submitted to the Local Government the rules and directions which they had framed for village sanitation, and their recommendations on the introduction of a Bill to provide for this object. Until funds are forthcoming, the Sanitary Board remark, and rules for sanitation are passed, no progress in the introduction of sanitary reforms can be expected.

Central Provinces.

In the Central Provinces the land lying around the reservoir of Jubbulpore waterworks was acquired in order to preserve the catchment area from pollution, and at Nagpur steps (since completed) were taken to achieve the same end. The Burhanpur waterworks were making progress, and at Raipur a commencement was made with similar works and have since been completed. With a view to the preparation of a drainage scheme, a survey was made of the towns of Nagpur and Jubbulpore, while a similar survey was in progress at Saugor. A surface drainage scheme for the town of Bilaspur was also sanctioned and taken in hand. In the head-quarter towns the expenditure on sanitation (excluding medical relief and vaccination) ranged from 38·82 per cent. of income at Bhandara to 10·18 at Sambalpur. During the year the Village Sanitation Act was extended to 40 villages, 33 of which are in the Nimar district, and in respect of a few of these, schemes of sanitary reform had been sanctioned, though the Chief Commissioner states: "In most cases all that can be done at present is to "provide new wells or improve existing ones."

The Sanitary Board held three meetings in the course of the year, and was chiefly occupied with the improvement of the sanitary condition of Nagpur and the scheme for village sanitary improvement which had been drawn up by the Chief Commissioner. His system embraces:—"(1) grouping the villages of a district into sanitary circles "of convenient size; (2) investigation by experts into the sanitary condition of each "circle with special reference to water-supply, conservancy and drainage, and "submission of proposals for improvement; (3) collation of such proposals with "information derived from the district executive authorities as to financial condition "of villages, &c.; (4) submission to and consideration by the Sanitary Board of such "proposals and other relevant information, and orders by the Board as to sanitary "works to be done, with distribution of available funds; (5) issue by the district "executive to the village authorities, panchayet or mukaddams of the Sanitary "Board's orders, and enforcement of the same."

Assam.

No sanitary works of much importance were executed in Assam during 1891. Out of their total income of Rs. 1,73,340 the municipalities spent 54·74 per cent. on sanitary and other improvements. In the course of his tour the Chief Commissioner visited the head-quarters of every district and sub-division in the plains districts, and was of opinion that on the whole progress was being made throughout the province in carrying out sanitary improvements. "The difficulties, however," he states, "in the "way of doing substantial work are very great owing to want of funds, and in order "to insure that money is spent to the best advantage and upon works of certain "benefit rather than on experiments, it has been decided that in places where "expensive water-supply schemes are impracticable, wells should be constructed "where the water-supply is deficient." As regards rural sanitation, the Chief Commissioner "found that Boards were doing as much as could reasonably be "expected from them with the means at their disposal, and having regard to the "extreme difficulty which must always be experienced in inducing the people living "in rural areas to pay any regard to sanitary requirements."

The Sanitary Board continued to do satisfactory work. During the year several suggestions and recommendations for improvements were proposed by them to the various authorities concerned.

Madras.

No great advance was made in sanitary improvements in Madras Municipality. The drainage of Black Town was making very little progress, and only one-fifth of the amount allotted for the purpose was utilised. The supply of water to the city from the Red Hills was insufficient in quantity and of inferior quality, and it was therefore found necessary to postpone further connexions with private premises. Hopes were entertained that the improvement of the water-supply of the town would before long be undertaken. The projects submitted to the Government had been investigated by an expert sent from England, whose report on the subject was awaited. To provide

funds for the scheme a special tax on tobacco was passed during the year, and is now in operation.

Excluding Madras Municipality, there were 55 other municipalities in the Presidency, and in these 37·6 per cent. of their total income (Rs. 26,52,995) was allotted to sanitation; but the actual expenditure during the first nine months of the year (1891–92) amounted to only 55·8 per cent. of the allotment. The Local Fund Boards also only expended 55 per cent. of their allotment for sanitation during the same period. The Government again called the attention of all municipal councils and presidents of boards to this small outlay. In only six of the municipalities did the expenditure on sanitation exceed 75 per cent. of the allotment. As in previous years, the works undertaken during 1891 were mostly of a minor nature, but in several towns drainage schemes and projects for improving water-supply were being carried out under the control of the Sanitary Engineer. "There has been greater "activity displayed," that officer remarks, "and greater anxiety evinced by councils "in regard to speedy improvement in water-supply or drainage than at any period "since the introduction of local self-government, and if only those schemes now under "preparation, in addition to those already sanctioned, are carried out within a "reasonable period, few of the provinces of India will be able to show such a stride "in sanitary progress." With a view to increase the efficiency of the Sanitary Engineer's department, the appointment of three Assistant Engineers was sanctioned, "each to be in charge of a circle, with the executive control of all works under "execution and all surveys in progress within that circle." As regards village sanitation, the Sanitary Commissioner reports that some progress in improvement has been made. "Many tanks and wells," he says, "have been deepened and cleaned out "and put in a much more satisfactory condition. So far as villages are concerned, "the evils lie mostly on the surface, and what is really wanted in villages is chiefly "to insure the maintenance of a pure water-supply, to keep the wells clean, and to "remove the rubbish to some distance from the village site."

Bombay.

The expenditure of the Health Department of the City of Bombay on sanitation in 1891–92 amounted to about 11½ lakhs. The Committee appointed by Government to consider the question of the change of drainage outlet from Worli to Colaba having decided on the retention of the former, new machinery for the Love Grove pumping station was sanctioned at a cost of 4 lakhs. The Tansa Waterworks, as a whole, were opened by the Viceroy on the 31st March 1892, from which date the regular supply of Tansa water to the city was commenced. The supply will be from 20 to 21 million gallons daily, instead of 17 million gallons as originally estimated. The area of the lake is stated to be nearly 6 miles, and a rainfall of 40 inches is sufficient to fill it, "so that even in the driest season no apprehension need be felt as to the sufficiency of "the water-supply." Several minor improvements were carried out in the city, such as the erection of latrines and urinals, and the repairing, altering, constructing, cleaning, and flushing of sewers and drains. In various localities 14,100 feet of new water mains were laid down, 2,391 feet of old pipes were renewed, and 479 house connexions with the mains were made, bringing the total of the latter at the end of the year up to 18,113.

In the other municipalities 7½ lakhs were devoted to conservancy. The construction of drains for the town of Hyderabad was approaching completion, and a similar scheme for Karachi was under contemplation. The new waterworks at Ahmedabad were formally opened by his Excellency the Governor on the 11th June 1891, and the greater portion of an experimental section of the drainage scheme was completed. Waterworks were in progress in Dhulia, and were commenced in Hubli, and in several other municipalities measures were under consideration for the improvement of the water-supply and drainage. From the notes of the Sanitary Commissioner's inspections it would appear that sanitation is very much neglected in many towns. "So far as my experience "goes," he says, "the cause of sanitation has not in any way prospered under local "self-government. On the contrary, several towns have of late appeared to me to be "growing more apathetic concerning this subject." The Government directed that Collectors and Presidents should be requested to urge on the local bodies the necessity of taking action on the lines indicated by the Sanitary Commissioner.

Since the close of the year under report a Sanitary Engineer has been appointed, and a Sanitary Board, consisting of this officer and the Sanitary Commissioner has been established.

Berar.

The municipalities of Berar spent 48·6 per cent. of their total income on sanitation during 1891–92, the expenditure for conservancy alone being 22·3 per cent. The surface drainage of several towns was extended, and considerable sums were expended

in improving the water-supply at Akola, Amraoti Town, Khamgaon, and Amraoti Camp. In districts (excluding municipalities), the total sum allotted to sanitary works amounted to Rs. 1,57,618, of which 24·9 per cent. was expended on conservancy, 18·7 on drainage, and 23·1 on water-supply. The principal work of the year was the completion of the Buldana water-supply at a total cost of Rs. 49,670, a scheme which provides for a population of 4,000 at the rate of 10 gallons per head. Works for supplying Akola with pure water was also commenced, and a sum of Rs. 14,850 spent on them during the year. This scheme will supply a population of 28,000 with 10 gallons of water per head.

In the province of Berar a Sanitary Board has been created for each district, and these district boards met twice at each headquarter station during 1891. "The "results of the Board's labours," the Sanitary Commissioner states, "show that but "little progress has been made in regard to village sanitation. The cause of this is "due to want of sufficient funds to carry out needful practical reforms, the want of a "proper supervising agency, and the absence of any law on village sanitation. . . . . "It is easy enough to demarcate limits, &c., and to require village sanitary boards to "instruct the people to observe these limits, but there is no means of enforcing "compliance, and as a rule no attention is paid to the Board's instructions." The Resident was not surprised at the Sanitary Commissioner's disappointment with the results of the year's work. "Rural sanitation," it is stated, "is perhaps the most difficult, and "certainly it is not the least important, problem of modern administration in India, "and the Resident is therefore glad to be able to agree with Colonel Mackenzie "(Commissioner of Berar) that, although local boards move slowly—and it is to be "remembered that they have only recently come into operation at Berar—still greater "care and attention is being given to sanitary matters all along the line." Regarding the need of a sanitation law, the Resident promised that if existing provisions were not sufficient, or if they could not be enforced, he would consider proposals for applying such a law to the province.

Military.

Bengal. The total expenditure on military sanitary works in the Bengal Command during 1891–92 amounted to Rs. 98,32,152, or Rs. 7,29,164 above the sum expended in the previous year. Details of the various works, however, have not yet been received.

Madras. Among the sanitary works carried out in the Madras Command in the course of the year the most important was the construction of a well in the military cholera camp at Ampana in Ganjam. A well was also sunk and new drains constructed at Vizianagram in Ganjam. At Calicut improvements were made in the lines at a cost of Rs. 13,688. And at other stations works of a minor character, having for their object the health and comfort of the troops, were either executed or in progress.

Bombay. The actual cost of military works in connexion with sanitation in the Bombay Command during 1891–92 was Rs. 44,175. The most important work carried out was the construction, at a cost of Rs. 12,932, of a new condenser at Aden, capable of producing 12,000 gallons of water. At other stations the work consisted mostly in improvements to barracks, buildings, and latrines.

India Office,
14th September 1893.

W. T. Ronson.

ABSTRACTS

OF

SANITARY AND OTHER REPORTS

FOR

1891.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1891.

(*Surgeon-General W. R. Rice, C.S.I., M.D.*)

European Troops.

Sickness and mortality in 1891.

The sickness of the European army of India was, according to the following table, less in 1891 than in the previous year, though the mortality was somewhat increased. The former fact was principally due to the great diminution of influenza and also of venereal disease, the latter to the increased prevalence of cholera.

Abstract of Statistics of European Troops in India.

Year.	Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
1870–79 - - - -	577,416	1,475	60	19·34	43	62
1881–90* - - - -	613,991	1,471	73	14·24	27	42
1890 - - - -	67,823	1,520	87	13·84	25	39
1891 - - - -	67,030	1,379	79	15·89	27	43

* Including troops in Afghanistan during 1881.

The chief causes of admission were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission rates were cholera (3·8 per 1,000 against 0·9), enteric fever (20·4 per 1,000 against 18·5), "other fevers" (2·6 per 1,000 against 0·7, mostly epidemic rose-rash), heat-stroke, circulatory diseases, and diarrhœa. On the other hand, the admission rate from influenza was reduced from 33·4 to 5·5, and the admission rates from pneumonia, other respiratory diseases, venereal diseases (400·7 per 1,000 against 503·5), malarial fevers, dysentery, hepatitis and splenic affections were also lessened. Venereal diseases caused 29 per cent. of the total sickness, and ague 25 per cent.

The chief causes of mortality were enteric fever, cholera, injuries, heat-stroke, and hepatic abscess. Among diseases with increased mortality were cholera (2·51 against 0·72), enteric fever (5·76 per 1,000 against 4·91), heat-stroke, and circulatory diseases. On the other hand, mortality from small-pox, pneumonia, dysentery, and abscess of the liver was lessened. Enteric fever caused 36 per cent. of the total deaths, as in the preceding year, and cholera 16 per cent.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial fevers, tubercle of the lungs, mental affections, hepatitis, injuries, palpitation, and dysentery.

Bengal Army.

In the European army of Bengal, sickness, from the comparative absence of influenza and from lessening of venereal disease, was diminished, while mortality, from the greater prevalence of cholera, was increased. Cholera mortality was higher than it had been since 1881.

European Army of Bengal.

Period.	Average Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870-79 - -	363,431	1,522	61	4·18	16·82	21·00	41	62
1881–90* - -	380,078	1,552	74	1·48	13·00	14·48	26	40
1890 - - -	41,353	1,584	89	0·99	14·51	15·50	25	41
1891 - - -	40 994	1,394	80	2·78	14·08	16·86	25	42

* Excluding troops in Afghanistan during 1881.

The chief forms of sickness were venereal diseases, ague, injuries, and diseases of the integuments, Among the diseases with increased admission-rates were cholera (4·1 per 1,000 against 1·2), "other fevers" (mostly epidemic, rose rash, and dengue) heat-stroke, circulatory diseases, diarrhœa, and enteric fever. On the other hand, the admission-rates from influenza (5·8 per 1,000 against 31·4), pneumonia (2·8 per 1,000 against 5·9), venereal diseases (395·3 per 1,000 against 504·0), simple continued fever, "other respiratory diseases", and scurvy were lessened. Venereal diseases caused 28 per cent. of the total sickness, and ague 26 per cent.

The chief causes of mortality were enteric fever, cholera, (and at an interval) injuries, hepatic abscess and heat-stroke. Among the diseases with increased mortality were especially cholera, malarial fevers, heat-stroke, and enteric fever. On the other hand, mortality from pneumonia, alcoholism, dysentery, and hepatic abscess was lessened. Enteric fever caused 40 per cent. of the total deaths, as in the preceding year, and cholera over 16 per cent.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial fevers, tubercle of the lungs, palpitation, injuries, hepatitis, and mental affections.

Madras Army.

Sickness in the European army of Madras, as may be seen from the following table, was less than in 1890, while mortality was somewhat greater, these results being due to a great decrease of influenza and also of venereal disease and an increase of cholera. The cholera mortality, though higher than that of 1890, was not so high as that of 1889:—

European Army of Madras.

Period.	Average Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79 - -	110,396	1,264	60	1·68	16·01	17·69	49	67
1881–90 - -	117,592	1,257	73	1·05	11·94	12·99	28	41
1890 - - -	13,707	1,442	91	0·07	12·77	12·84	23	36
1891 - - -	13,324	1,304	82	1·58	12·91	14·49	31	46

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever, Among the diseases with increased admission-rates were cholera (2·2 per 1,000 against 0·1), "other fevers" (8·0 per 1,000 against 0·2, mostly epidemic rose rash), heat-stroke, and enteric fever. On the other hand, the admission-rate from influenza sank from 52·2 to 8·0, and that from venereal diseases from 491·2 to 402·1; while the admission-rates from malarial fevers, respiratory diseases, and hepatitis were also lessened. Venereal diseases caused 31 per cent. of the total sickness, and ague 19 per cent.

The chief causes of mortality were enteric fever, cholera, injuries, heat-stroke, hepatic abscess, and remittent fever. Among the diseases with increased mortality were cholera, pneumonia, abscess of the liver, circulatory diseases, heat-stroke, and alcoholism. On the other hand, mortality from enteric fever, malarial fevers, dysentery, and suicide was lessened. Enteric fever caused 21 per cent. of the total deaths, and cholera and injuries each 11 per cent.

The chief causes of invaliding were, in order, syphilis and gonorrhœa, debility, mental affections, hepatitis, dysentery, malarial fevers, tubercle of the lungs, and valve disease of the heart.

Bombay Army.

In the European army of Bombay, although the constantly sick-rate was diminished, there was a rise in the admission-rate and in the death-rate. While influenza and venereal disease sank, cholera, bowel complaints, and enteric fever increased. The cholera mortality was greater than it had been since 1885.

European Army of Bombay.

Period.	Average Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79 - -	103,587	1,533	57	1·53	13·74	15·27	43	58
1881–1890* - -	113,779	1,431	69	1·87	12·03	13·90	32	46
1890 - - -	12,763	1,396	77	0·55	9·01	9·56	29	38
1891 - - -	12,713	1,409	73	2·60	11·94	4·24	29	43

* Excluding troops in Afghanistan during 1881.

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission-ratios were cholera (4·2 per 1,000 against 0·5), enteric fever (15·7 per 1,000 against 10·2), bowel complaints, and ague. On the other hand, the admission-rates from influenza (2·1 per 1,000 against 19·4), venereal diseases (417·1 per 1,000 against 515·5), respiratory diseases, smallpox, and hepatitis were lessened. Venereal diseases caused 30 per cent. of the total sickness, and ague 26 per cent.

The chief causes of mortality were enteric fever (at an interval), cholera (at an interval), injuries, and heat-stroke. Among the diseases with increased mortality were cholera, enteric fever (5·58 per 1,000 against 1·88), and heat-stroke. On the other hand, mortality from suicide, remittent fever, alcoholism, and hepatitis was lessened. Enteric fever caused 39 per cent. of the total deaths, and cholera 18 per cent.

The chief causes of invaliding were, in order, debility, malarial fevers, syphilis and gonorrhœa, tubercle of the lungs, injuries, palpitation, diseases of the ear, mental affections, and valve disease of the heart.

The health statistics of the troops serving in Quetta were decidedly less favourable than in 1890, all the ratios in the following table being increased :—

Period.	Average Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1884 - - -	1,441	2,056	82	27·07	41·63	68·70
1885 - - - -	1,672	2,187	94	42·46	40·67	83·13
1886 - - -	1,752	2,442	73	20·57	19·41	19·98
1887 - - - -	1,932	1,374	52	1·03	10·35	11·38
1888 - - -	2,223	1,140	59	—	13·50	13·50
1889 - - - -	2,210	1,152	58	0·90	9·05	9·95
1890 - - -	2,019	1,099	58	—	9·41	9·41
1891* - - - -	2,162	1,621	62	6·48	7·40	13·88

* Excluding troops on the march.

There was great increased prevalence of cholera, ague, and simple continued fever, and greatly increased mortality from cholera.

The statistics of Gnathong in Sikkim for 1891 were better than those of 1890, which was the first year of its occupation.

Period.	Average Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1890 - - - -	78	1,782	64	—	38·46	38·46
1891 - - - -	104	1,192	58	—	9·62	9·62

Some influenza occurred, but there was a great decrease in ague. The only death of the year was by exhaustion from cold in the case of a man who had lost his way.

The vital statistics of the troops serving in Burma were, as shown in the following table, better in 1891 than in 1890, with the exception of mortality from cholera :—

European Troops in Burma.

Period.	Average Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1888* - - -	4,061	1,681	87	9·60	22·90	32·50
1889 - - - -	4,825	1,903	92	2·49	26·73	29·22
1890 - - -	4,712	1,743	102	—	20·80	20·80
1891 - - - -	4,623	1,589	92	2·38	17·74	20·12

* Excluding men on active service for the first three months of the year.

Burma was distinguished by the prevalence of influenza, malarial fevers, simple continued fever, dysentery, and hepatitis.

Some of the more important causes of admission into hospital in the three Presidencies are shown in the following table in the direct order of their ratios :—

Admitted per 1,000 *of strength.*

Bengal.	1891.	1890.	1881 to 1890.	Madras.	1891.	1890.	1881 to 1890.	Bombay.	1891.	1890.	1881 to 1890.
Venereal diseases - -	395	504	366	Venereal diseases -	402	491	367	Venereal diseases -	417	515	330
Ague - - -	369	400	459	Ague - - -	249	277	195	Ague - - -	360	288	409
Simple continued fever -	40	67	68	Simple continued fever -	70	55	52	Simple continued fever -	60	57	66
Respiratory diseases -	37	45	74*	Dysentery - -	48	44	52	Diarrhœa - -	39	31	43
Rheumatism and neuralgia.	36	37	44	Rheumatism and neuralgia.	37	46	39	Respiratory diseases -	30	33	64*
Diarrhœa - -	35	33	46	Respiratory diseases -	28	30	40*	Rheumatism and neuralgia.	28	32	37
Enteric fever - -	25	24	15	Hepatitis - -	26	28	35	Dysentery - - -	25	20	22
Dysentery - -	23	27	26	Diarrhœa - -	13	17	40	Hepatitis - - -	17	18	20
Hepatitis - - -	18	20	24	Enteric fever - -	11	9	9·	Enteric fever - -	16	10	10
Remittent fever - - -	7	9	10	Remittent fever - -	8	10	8	Phthisis pulmonalis -	5	5	6
Influenza - - -	6	31	3	Influenza - - -	8	52	6	Remittent fever - -	5	5	10
Phthisis pulmonalis -	4	4	6	Phthisis pulmonalis -	3	4	5	Influenza - - -	2	19	2
Spleen diseases - -	3	3	4	Spleen diseases - -	1	2	1	Spleen diseases - -	2	2	3
Total from all causes	1,394	1,584	1,552	Total from all causes	1,304	1,442	1,257	Total from all causes	1,409	1,396	1,431

* Including tonsillitis and sore throat.

In all three Presidencies venereal diseases head the list, but show ratios much lower than in the previous year, though still considerably higher than the ratios of the decennium 1881–90. Ague comes next, and here also each ratio is lower than the corresponding one of the preceding year. Those of Bengal and Bombay are lower than the decennial ratios; that of Madras higher, on account of the addition of Burma to the command from 1886. Bengal had the highest admission ratios from ague, respiratory diseases, enteric fever, and splenic affections; Madras the highest from simple continued fever, rheumatism, influenza, dysentery, hepatitis and remittent fever; Bombay the highest from venereal diseases, diarrhœa, phthisis, and all causes.

Some of the more important causes of death in the three Presidencies are shown in the following table:—

Deaths from the Chief Diseases and from all Causes in the three Presidencies per 1,000 of strength.

Deaths from	Bengal.			Deaths from	Madras.			Deaths from	Bombay.		
	1891.	1890.	1881–90.		1891.	1890.	1881–90.		1891.	1890.	1881–90.
Enteric fever	6·64	6·26	4·33	Enteric fever	3·08	3·65	2·73	Enteric fever	5·58	1·88	3·07
Cholera	2·78	·99	1·48	Cholera	1·58	·07	1·05	Cholera	2·60	·55	1·87
Hepatic: Abscess	·98	·8	1·25	Hepatic: Abscess	1·35	·95	1·93	Hepatic: Abscess	·55	·71	·97
Hepatic: Congestion and inflammation	·05	0·2		Hepatic: Congestion and inflammation	·23	·22		Hepatic: Congestion and inflammation	·16	·24	
Pneumonia	·51	1·23	·89*	Remittent fever	·83	1·02	·69	Phthisis pulmonalis	·63	·86	·68
Other respiratory diseases	·10	·24		Pneumonia	·68	·29	·42*	Pneumonia	·47	·47	·89*
Phthisis pulmonalis	·61	·58	·82	Other respiratory diseases	·08	·29		Other respiratory diseases	·08	·39	
Dysentery	·44	·73	·60	Dysentery	·45	·95	·98	Dysentery	·47	·55	·98
Remittent fever	·39	·34	·45	Phthisis pulmonalis	·30	·58	·59	Diarrhœa	·16	·08	·11
Diarrhœa	·07	·05	·07	Diarrhœa	—	—	·13	Remitteut fever	·08	·31	·60
TOTAL FROM ALL CAUSES	16·86	15·50	14·48	TOTAL FROM ALL CAUSES	14·49	12·84	12·99	TOTAL FROM ALL CAUSES	14·24	9·56	13·90

* Including tonsillitis and sorethroat.

In all three Presidencies enteric fever heads the list, and is followed by cholera and then by abscess of the liver. The ratios of enteric fever and cholera in 1891 were above the decennial rates, the ratio of hepatitis below the decennial rate, in all three Presidencies.

Bengal had the highest death-rates from enteric fever, respiratory diseases other than pneumonia, and cholera; Madras the highest from pneumonia, hepatic abscess, hepatitis, and remittent fever; Bombay the highest from dysentery, phthisis, and diarrhœa. Mortality from enteric fever decreased in Madras, slightly increased in Bengal, but greatly increased in Bombay. The percentage respectively of enteric fever, hepatitis, dysentery, and pneumonia in the total deaths of each Presidency was:—

1891.

	Bengal.	Madras.	Bombay.
Enteric fever	39·4	21·2	39·2
Hepatitis	6·1	10·9	5·0
Dysentery	2·6	3·1	3·3
Pneumonia	3·0	4·7	3·3

Bengal was highest in enteric fever; Madras in hepatitis and pneumomia; and Bombay in dysentery.

This year by order of the Government of India the old geographical groups have been discarded in favour of a new set arranged by a committee. These new groups are to be adhered to by both the Medical and the Meteorological Departments, and also closely correspond with the divisions adopted for revenue and agricultural returns. They are to be used equally for the statistics of European troops, of native troops, and of prisoners, and are numbered and named as follows:—

Groups.

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
Burma Coast and Bay Islands.	Burma Inland.	Assam.	Bengal and Orissa.	Gangetic Plain and Chutia-Nagpur.	Upper Sub-Himalayan.	Indus Valley and N.W. Rajputana.	S.E. Rajputana, C. India, and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.

But, as there are no European troops in Assam, and as it is necessary to separate Hill Convalescent Depôts from Hill Stations, the columns in the case of European troops will stand as follows:—

Groups.

I.	II.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII*a*.	XII*b*.
Burma Coast and Bay Islands.	Burma Inland.	Bengal and Orissa.	Gangetic Plain and Chutia-Nagpur.	Upper Sub-Himalayan.	Indus Valley and N.W. Rajputana.	S.E. Rajputana, C. India, and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	Hill Convalescent Depôts.

Of the 12 annual ratios of constantly sick, 8 were higher than the ratio of India, and 4 lower, the highest ratio being that of Inland Burma, and the lowest that of the Hill Stations. The highest admission ratio was that of Bengal and Orissa, and the lowest that of the Hill Stations. Burma Coast had the highest admission-ratios from remittent fever, simple continued fever, dysentery, hepatitis, and urinary diseases; Burma Inland the highest from influenza and ague; Bengal and Orissa the highest from circulatory diseases, respiratory diseases other than pneumonia, diarrhœa, rheumatism, and entozoa; the Gangetic Plain the highest from cholera, enteric fever, heatstroke, and eye diseases; Central India the highest from tubercle of the lungs and scurvy; the Western Coast the highest from nervous diseases, abscess of the liver, venereal diseases, diseases of the integuments, and injuries; Southern India the highest from "other fevers" and pneumonia; the Hill Stations the highest from alcoholism; and the Hill Convalescent Depôts the highest from tonsillitis and spleen diseases.

Of the 12 annual ratios of mortality 6 were higher and 6 lower than the ratio of India; that of the Gangetic Plain being the highest, and that of the Western Coast the lowest. Burma Coast had the highest death-rates from remittent fever, alcoholism, valvular disease and aneurysm, and urinary diseases; Burma Inland the highest from ague and heatstroke; Bengal and Orissa the highest from nervous diseases, respiratory diseases other than pneumonia, dysentery, and injuries; the Gangetic Plain the highest from cholera; the Western Coast the highest from tubercle of the lungs; Southern India the highest from pneumonia; and the Hill Convalescent Depôts the highest from enteric fever, hepatic abscess, and hepatitis.

The following shows how the composition of 100 deaths varied in the groups:—

Percentage in Total Deaths.

Deaths from	1. Burma Coast and Bay Islands.	2. Burma Inland.	3. Bengal and Orissa.	4. Gangetic Plain and Chutia Nagpur.	5. Upper Sub-Himalayan.	6. Indus Valley and North-West Rajputana.	7. South-East Rajputana, Central India, and Gujarat.	8. Deccan.	9. Western Coast.	10. Southern India.	11. Hill Stations.	12. Hill Convalescent Depôts.
Cholera	—	4·1	2·7	39·6	6·7	25·9	21·7	14·4	—	2·0	14·2	—
Enteric fever	21·7	24·5	29·7	26·8	46·6	35·2	38·7	37·8	—	29·4	50·0	51·1
Remittent fever	13·0	8·2	2·7	·6	5·0	—	—	—	—	3·9	—	4·4
Dysentery	4·3	6·1	8·1	3·7	1·7	—	3·8	4·5	—	2·0	—	2·2
Diarrhœa	—	—	—	·6	·4	—	·9	1·8	—	—	—	—
Abscess of liver	13·0	6·1	10·8	3·0	5·5	1·9	3·8	8·1	28·6	11·8	6·6	13·3
Pneumonia	4·3	2·0	2·7	1·8	3·8	—	2·8	2·7	—	9·8	4·7	4·4
Tubercle of the lungs	4·3	—	—	3·0	3·4	1·9	1·9	2·7	14·3	—	2·8	—
Total from all Causes	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

It shows that, viewed in proportion to the total deaths from all causes, remittent fever formed a more important item in Burma Coast than in other groups; dysentery in Bengal and Orissa; cholera in the Gangetic Plain; tubercle of the lungs and abscess of the liver on the Western Coast; pneumonia in Southern India; and enteric fever in the Hill Convalescent Depôts and Hill Stations.

In 1891 influenza came down from 2,263 cases, 33 per 1,000 of strength, to 372 cases, 5·5 per 1,000 of strength; in 1891 the number of stations attacked was much reduced, the disease being practically confined, with the exception of Thayetmyo and Aden, to the Himalayan and Upper Sub-Himalayan Stations; and in 1891 the disease reached its monthly maximum in July instead of in April. Principal diseases: Influenza.

The amount of cholera was much greater than in the preceding year. There were 252 admissions against 58, and 168 deaths against 49. The permillage of admissions to strength was 3·8, and of deaths 2·51, and the percentage of deaths to cases 66·67. The corresponding figures of 1890 were 0·9, 0·72, and 84·48; and of the decennium 1881–90, 2·1, 1·46, and 68·11. The greatest number of cases occurred in May and September; and there was more cholera in the second half of the year than in the first. Cholera.

The ratios of morbidity, mortality, and fatality in the Bengal army were respectively 4·1, 2·78, and 67·06, against 1·2, 0·99, and 82·00 in 1890, and against 2·2, 1·48, and 67·59 in the decennium 1881–90. Of the total 170 cases 32 per cent. occurred in May, and 20 per cent. in September. The station most severely affected was Lucknow, where there were 51 cases with 29 deaths in May.

In the Madras army there were 29 cases of cholera, a ratio of 2·2, against 1, and 21 deaths, a ratio of 1·58, against 0·07. The fatality was 72·41 against 100·00 in 1890, and 70·69 in the decennium 1881–90. There were 13 cases in May, and 12 in October, the former among troops marching and the latter at South Secunderabad.

The morbidity ratio of the Bombay army rose from 0·5 to 4·2, the mortality ratio from 0·55 to 2·60; while the fatality ratio was 62·26 against 100·00 in 1890, and 68·05 in the decennium 1881–90. Out of the 53 cases 85 per cent. occurred in August and September. Nasirabad had 29 cases in August-September.

Smallpox was less prevalent. There were 14 admissions (0·2 per 1,000) and 1 death (0·01 per 1,000) against 36 (0·5 per 1,000) and 4 (0·06 per 1,000) in 1890. All three Presidencies participated in the reduction. The greatest number of cases at any one station was 4 at Agra, and the only death occurred at Bareilly. Small-pox.

Ague gave rise to about 25 per cent. of the admissions from all causes in the army of India. The admission-rate (343·5) was nearly 11 per 1,000 lower than in the preceding year. The admission-rate rose only in the Bombay army, and the death-rate only in the Bengal army. Fevers.

The most malarious groups were Burma Inland and Bengal-Orissa, and the least malarious Southern India and Burma Coast. September and October were the most malarious months for India, though not for the Madras Presidency.

The admission and death ratios from remittent fever fell respectively from 8·1 and 0·47 to 6·8 and 0·42. All the Presidencies participated in the decrease of admission; and only in Bengal was there an increase of mortality. Amongst groups the highest ratios were those of Burma Coast and Burma Inland, and the lowest those of Western Coast and Southern India.

For India the admission ratio from simple continued fever was reduced from 62·5 to 49·8, while, as in 1890, there was only one death. No deaths were returned under this head from the Bengal and Madras armies. Both Madras and Bombay had increased admission-rates. Burma Coast and Western Coast had the highest ratios, and Bengal-Orissa the lowest ratio. Medical officers frequently note that many of the cases returned as simple continued fever are in all probability really mild cases of enteric fever with symptoms too indefinite to justify a diagnosis of the more serious malady. Some medical officers draw the line between simple continued fever and enteric fever differently from others.

On page 476 of the *Lancet* of 1892 it is noted that "there are rare cases of enteric fever in which the intestinal glands are not affected." Again, in a Norwegian medical magazine (quoted in Virchow and Hirsch's *Jahresberich*), Dr. Krafling,* in support of the importance of bacteriology in the diagnosis of enteric fever, cites a case and insists that in cases of undoubted enteric fever the anatomical changes may be very trifling and may consist only of a scarcely noticeable swelling of Peyer's patches and some mesenteric glands. No further report on the bacteriological examination of tissues of Indian enteric cases has been received from Professor Fischer of Kiel, and no account Enteric fever.

* Spelt Krœfting in another reference.

of bacteriological work by officers in India has come to hand. A certain number of French bacteriologists, followed by some English, have insisted upon the ultimate identity of the enteric bacillus with the *bacillus coli communis*, the two being regarded simply as varieties. This is the bacteriological expression of the opinion occasionally heard in India that the enteric fever of India is a "kind of fermentative change set up "in the intestines by the influence of climate, &c." But the leading bacteriologists of Europe hold to the opinion that the bacillus of enteric and the *bacillus coli communis* are specifically distinct, and that the active cause of enteric fever always enters the body from without. From a sanitary point of view the latter is the safer opinion to act upon in the meantime. Four points have lately been specially insisted upon as distinguishing the two bacilli,—the difference in the flagella, the difference in sugar-fermentative power, the difference in power of congulating milk, and the difference in power of evolving gas in plain bouillon. But the whole investigation is a very difficult one, and in it no amount of enthusiasm will compensate for lack of training and apparatus. What is wanted in India is not more private work by medical officers, however enthusiastic, but work by trained experts in properly-equipped laboratories to supplement the clinical work of medical officers. Meanwhile it should be borne in mind that the finding of the enteric bacillus in a few cases of Indian fever, though it proves that the same enteric fever occurs in India as in Europe, does not prove that all Indian continued or remittent fevers are of the same kind. Indeed, the anomalous clinical and pathological character of many Indian cases of fever raises the suspicion that much remains still to be done in the way of differentiation. As happened in the case of typhus and typhoid in Europe, a time may come when men will wonder how certain Indian fevers ever came to be confused one with another and lumped together. Though medical officers are obliged to return all cases of fever under one or other of the heads laid down in the official nomenclature, they are not bound to classify them exactly in the same way in their own minds. If, taught by the past, medical men in India go on patiently recording all the indications of which they catch sight, the men at length will arise who shall gather up all the clues and read aloud the secret.

There are two points mentioned by medical officers which deserve special attention. One is the danger which soldiers incur when marching from one well-kept cantonment to another, and perhaps especially from the plains to the hills,—they have to pass through a belt of insanitation, to wade, as it were, from cleanliness through filth to cleanliness, many contracting enteric fever on the way. The other is the danger, as far as the spread of the disease goes, of many mild cases of fever, suspected or unsuspected, being really cases of enteric fever; nearly all medical officers refer to such cases. Recent researches seem to show that the enteric bacillus may remain alive for considerable periods in fæces and earth. So that in all cases where there can be any suspicion of enteric the dejecta should be disinfected. Three per cent. of a freshly slaked 22 per cent. milk of lime well mixed in is said to be an effective disinfectant.

There was an increase of both morbidity and mortality from enteric fever in 1891. As compared with the corresponding ratios of 1890, the admission (20·4) and death (5·73) ratios for enteric fever increased respectively by 1·9 and 0·82 per 1,000 of strength. There were 1,366 admissions and 384 deaths in 1891 against 1,253 and 333 in 1890.

The following table shows the admission and death-rates from enteric and from intermittent, remittent, and simple continued fevers in the three Presidencies for a series of years :—

Period.	Bengal.						Madras.						Bombay.					
	Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.		
	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.
1870-79* - -	5·3	607·3	612·6	2·28	1·74	4·02	3·9	266·5	270·4	1·42	0·62	2·04	3·1	659·9	663·0	1·75	1·14	2·89
1881-90† - -	15·2	536·0	551·2	4·33	0·59	4·92	9·0	254·6	263·6	2·73	0·91	3·64	10·0	486·6	496·6	3·07	0·85	3·92
1890 - -	24·1	475·5	499·6	6·26	0·39	6·65	9·3	341·8	351·1	3·65	1·67	5·32	10·2	349·0	359·2	1·88	0·39	2·27
1891 - - -	24·9	416·3	441·2	6·64	0·56	7·20	10·8	327·3	338·1	3·08	1·21	4·29	15·7	424·8	440·5	5·58	0·16	5·74

* Including troops on active service and on the march.

† Excluding Bengal and Bombay troops in Afghanistan during 1881.

With regard to both admissions and deaths from enteric fever, Bengal stood highest The admission ratios of all three Presidencies, and the death ratios of Bengal and Bombay, were higher than the corresponding ratios of 1890. All the enteric ratios both of admission and death were above the decennial ratios of 1881–90. The increase of non-enteric fevers in the Madras Army since 1885 is due to the new territory of Upper Burma having been placed under that Command. On the whole, the table shows the gradual increase in the diagnosis of enteric fever; but also, by the rising mortality, a real increase of enteric fever. The following table is to facilitate the study of the same mortalities :—

	During 1870–79.			During 1881–90.			During 1890.			During 1891.		
	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.
Army of India†	2·03	1·42	3·45	3·79	0·70	4·49	4·91	0·64	5·55	5·73	0·61	6·34
„ Bengal‡	2·28	1·74	4·02	4·33	0·59	4·92	6·26	0·39	6·65	6·64	0·56	7·20
„ Madras†	1·42	0·62	2·04	2·73	0·91	3·64	3·65	1·67	5·32	3·08	1·21	4·29
„ Bombay‡	1·75	1·14	2·89	3·07	0·85	3·92	1·88	0·39	2·27	5·58	0·16	5·74

* Intermittent, remittent, and simple continued fevers.
† Excluding troops on active service in Burma during 1885 to 1887.
‡ Excluding troops in Afghanistan during 1881.

It shows that in the last 10 years, and especially of recent years, there has been an increase in total fever mortality, usually ascribed to the greater youthfulness and recent arrival of the soldiers of to-day; and an increase of mortality from enteric fever accompanied by a decrease in mortality from the other fevers, which is probably partly due to increased susceptibility on the part of the army, from youth and recent arrival, and partly due to the greater frequency with which the diagnosis of enteric fever is now made.

In the following table the geographical groups are arranged in the direct order of their admission rates from enteric fever :—

Groups and their Numbers.	Average strength.	Number of Cases.	Admissions per 1,000.	Number of Deaths.	Deaths per 1,000.	Percentage of Deaths to Cases.
V. Gangetic Plain and Chutia Nagpur	6,714	210	31·3	44	6·55	17·53
VI. Upper Sub Himalayan	12,711	395	31·1	111	8·73	22·75
VIII. S.-E. Rajputana, C. India, and Gujarat	5,868	152	25·9	41	6·99	24·12
XII*a*. Hill Stations	9,082	193	21·3	53	5·84	26·90
XI. Southern India	3,579	70	19·6	15	4·19	20·55
XII*b*. Hill Convalescent Depôts	2,577	42	16·3	23	8·93	53·49
IX. Deccan	9,490	126	13·3	42	4·43	32·56
VII. Indus Valley and N.-W. Rajputana	4,627	56	12·1	19	4·11	29·23
IV. Bengal and Orissa	2,207	24	10·9	11	4·98	45·83
II. Burma Inland	2,711	23	8·5	12	4·43	48·00
I. Burma Coast and Bay Islands	1,624	6	3·7	5	3·08	83·33
X. Western Coast	1,304	3	2·3	—	—	—
Army of Bengal	40,994	1,022	24·9	272	6·64	22·99
Army of Madras	13,324	144	10·8	41	3·08	27·33
Army of Bombay	12,713	200	15·7	71	5·58	34·13
Army of India	67,030	1,366	20·4	384	5·73	24·82

Four of the groups had ratios higher than the ratio for India. The admission rate varied from 31 per 1,000 in the Gangetic Plain and the Upper Sub-Himalayan group to 2 per 1,000 on the Western Coast and 4 per 1,000 on the Burma Coast. Five of

the groups had mortalities higher than that of India. Mortality varied from 9 per 1,000 in the Hill Convalescent Depôts and Upper Sub-Himalayan group, to 3 per 1,000 on the Burma Coast. In the first four groups the fatality varied inversely as the morbidity. The highest fatalities were 83 on the Burma Coast and 53 in the Hill Depôts, and the lowest 18 in the Gangetic Plain and 33 in the Upper Sub-Himalayan Group.

The following shows those garrisons of India which had an average strength of over 1,000, arranged in the direct order of their admission ratios from enteric fever:—

ENTERIC FEVER in 1891.

Stations over 1,000 *strong.*

Stations.	Average Annual Strength.	Admission rate per 1,000 of Strength.	Death-rate per 1,000 of Strength.	Died out of each 100 Cases treated.
Lucknow	2,143	58·8	9·33	12·82
Rawal Pindi	2,304	50·3	13·45	24·03
Bareilly	1,130	49·6	9·73	11·11
Sialkot	1,301	35·4	6·15	13·33
Meerut	1,774	34·4	9·02	22·86
Allahabad	1,024	21·5	3·91	14·81
Chakrata	1,137	20·2	5·28	26·09
Mhow	1,652	20·0	6·05	28·57
Agra	1,174	19·6	·85	3·85
Peshawar	1,445	19·4	7·61	35·48
Poona	2,030	19·2	6·90	34·15
Secunderabad, South	1,562	16·6	3·20	19·23
Umballa	1,632	15·9	6·13	33·33
Meean Meer	1,101	12·7	3·63	25·00
Bangalore, South	1,073	10·3	2·80	21·43
Quetta	2,162	9·7	1·85	18·18
Ferozepore	1,002	9·0	2·00	22·22
Fort William	1,094	8·2	3·66	44·44
Kurrachee	1,095	4·6	1·83	28·57
Belgaum	1,058	—	—	—

The two highest admission ratios of 1891 were not so high as the two highest of 1890. The two highest of 1891 were those of Lucknow and Rawal Pindi, both of which were higher than in the previous year. The lowest admission ratios were those of Belgaum, Kurrachee, and Fort William, the two first being lower than in 1890, and the last higher. Rawal Pindi had the highest death-rate, 13·45 per 1,000, and Belgaum (0·00), and Kurrachee (1·83) the lowest. Fatality varied from 44 at Fort William to 4 at Agra. Twenty-two stations had no enteric fever. Of these Bhamo, Moradabad, Hyderabad (Sind), Satara, Malliapuram, Pallavaram, Gnathong, Kuldunnah, Mount Abu, Ramandroog, Wellington Station, and Khandalla had also had no enteric fever in the preceding year.

The following table shows the greater liability of the young soldier to die from enteric fever, and the decreasing liability with advancing age:—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Ages, together with Ratios of Liability to it.

Year.	Mortality from Enteric Fever and Ratio of Liability to it at Different Ages.					
	24 and under.		25 to 29.		30 to 34.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	9·81	64·50	3·25	21·37	1·83	12·03
1890	7·78	65·93	2 84	24·07	1·18	10·00
1891	9·11	68·65	2·97	22·38	·71	5·35

Again, the following shows that the recently arrived soldier is more apt to die from enteric fever than he who has been longer in the country, and that with increased length of service in India the liability to death from enteric fever rapidly diminishes :—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Periods of Residence in India, together with the Ratios of Liability to it.

Year.	Mortality from Enteric Fever, and Ratio of Liability to it at Different Periods of Residence in India.					
	1st and 2nd Years.		3rd to 5th Year.		6th to 10th Year.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	11·65	57·02	4·20	20·56	2·43	11·89
1890	10·21	66·47	2·98	19·40	2·17	14·13
1891	11·60	64·19	3·64	10·14	2·23	2·34

As in former years, medical officers were usually unable, even to their own satisfaction, to trace out in any given outbreak a definite insanitary condition to which the outbreak might with certainty be attributed. Most medical officers lay stress on the influence of climate acting on young and unseasoned soldiers; many noticing that increase of the disease in a station is connected with the arrival of drafts from the old country, and that these bodies of men afterwards gradually become "acclimatised." In many cases, from what is known of the period of incubation of enteric fever, it was believed that these drafts had imbibed the active cause of the disease on their way inland from the port of landing, the men being inexperienced, and the arrangements made to protect their inexperience being insufficient. Many medical officers suspect strongly the bazar supplies, especially the bazar drinks, obtained privately by the men; and also impure water drunk casually by soldiers out walking or on the march. Indeed, in 1891, more than ever, medical officers, from a consideration of period of incubation, were struck by the great liability of men to contract enteric fever while on the march, especially on the march between the plains and the hills, this being, they think, probably due to the insanitary conditions encountered *en route*. In several cases chill or exposure to the sun, especially if combined with fatigue, is mentioned as at least a predisposing cause; and it is even hinted that enteric fever may sometimes be merely a more severe development of the simple continued fever which is apt to follow such exposures.

Bowel complaints.

The admission and death-rate from dysentery in the Army of India were slightly reduced (from 29·1 and 0·74 respectively in 1890 to 28·7 and 0·45), those from diarrhœa somewhat increased (from 29·5 and 0·04 to 31·5 and 0·07).

Dysentery was most prevalent in the Madras Army, least so in the Bombay Army. In Bengal the admission rate (23 per 1,000) was lower than in 1890, whereas in Madras (48 per 1,000) and Bombay (25 per 1,000), it was higher. In Bengal and Madras the admission ratio was lower than the 1881–90 decennial ratio, but in Bombay higher. Mortality from dysentery was highest in the Bombay Army (0·47), lowest in the Bengal Army (0·44). In all three Presidencies the death-rate was lower than in 1890; and in all it was lower than the 1881–90 decennial average.

Diarrhœa was most prevalent in the Bombay Army, least so in the Madras Army. In Madras only was the admission-rate lower than in 1890; but in all three Presidencies it was lower than the 1881–90 decennial average. Mortality from diarrhœa was highest in the Bombay Army (0·16), and absent in the Madras Army. In Bengal and Bombay mortality was higher than in 1890, but in Madras it remained the same. Compared with the 1881–90 decennial average it remained the same in Bengal, decreased in Madras, and increased in Bombay.

Hepatitis.

There was during the year under review a decrease both in the sickness and in the mortality due to hepatitis. The admission rate (19 per 1,000) had never been lower, and the death-rate (1·07) not since 1885. The ratios of Madras (26 and 1·58) were as usual, higher than those of the other Presidencies. Those of Bombay (17 and 0·71) were the lowest. In all cases the ratios were below those of the decennia.

The percentage of hepatic abscess in the total causes of death, as well as the mortality per 1,000 of strength, was highest in Madras (9·3), lowest in Bombay (3·9).

Respiratory diseases.

That there was a considerable decrease in respiratory morbidity and mortality was due to the decline of the influenza epidemic. The admission-rate declined from 40 to 34 per 1,000, and the death-rate from 1·18 to 0·78. Bengal had the highest admission ratio (37 per 1,000), Madras the lowest (28). In all three Presidencies the admission ratio was lower than in 1890, and below the 1870–79 decennial average. Bengal had the highest mortality (0·83), Bombay the lowest (0·63). In Madras only was the mortality (0·76) higher than in the preceding year, and than the decennial ratio.

Venereal disease in the Army of India.

A careful investigation has been made of the venereal statistics of many years back, and especially into the cause of the increase of venereal disease of recent years with reference to the efficacy of lock hospitals. The following are the chief results arrived at*:—

(1.) Within at least three years of institution lock hospitals produced a decided effect in checking venereal disease in the stations where they were opened.

(2.) When certain lock hospitals were experimentally closed, the venereal ratio for those stations rose to a great height as compared with the ratio of those stations where lock hospitals were retained.

(3.) On the abolition of lock hospitals there was a special rise of the venereal ratio for those stations that had had lock hospitals.

(4.) Taking the period during which lock hospitals were in activity as a whole, the ratio for stations with lock hospitals was lower than that for stations without lock hospitals, although the ratio for the former class of stations had been higher than that for the latter class before the institution of lock hospitals.

(5.) When stations are divided into those that had and those that had not lock hospitals, it is found that venereal ratios rose in both, but less and less rapidly in the former than in the latter.

(6.) A very probable cause of the increase of venereal ratios in both classes of stations since 1877 was the increased importation of fresh, young, unmarried men,† the lock hospitals existing in certain stations having there exerted a certain amount of restraining influence upon the increase.

In addition, as explaining the fall of the venereal ratios in 1891, the following statements may be made:—

(7.) There was no marked change in respect of any of the factors mentioned in (6) above, but, on the other hand, the new cantonment hospitals were in existence.

(8.) While the medical officers of many stations say nothing about the working of the voluntary venereal arrangements in connexion with the new cantonment hospitals, the testimony of those medical officers who do mention the subject is sufficiently definite to show that these new arrangements were capable of producing, and did produce, a marked effect in diminishing venereal disease. But whether they produced the whole of the reduction in 1891 must be left undecided for the present.

(9.) Two medical officers suggest that the reductions in their stations was partly due to so large a proportion of the men of the garrison having been already syphilised during the preceding two years that the garrison had acquired a certain amount of immunity against primary infection.

(10.) The preceding two paragraphs give what has been learned by a study of the opinions of medical officers of *Station Hospitals* in their "Annual Reports of Medical Transactions." The returns from many of the new *Cantonment Hospitals* themselves are still wanting. Most of those that have been received do not show large attendances of either venereal or other patients; but it is not so important that large numbers should be treated as that the real spreaders of disease should come under treatment. *One* diseased woman, if visited by many men, may work great havoc in a station. Again, low admission among women may mean either absence of disease or failure to take advantage of the hospitals.

Venereal disease caused *directly* 29 per cent. of the admissions, 0·28 per cent. of the deaths, and 15 per cent. of the invaliding of the Army of India. The admission-rate

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* The figures are under the consideration of Government. † In other words, the short-service system.

fell 103 per 1,000 of strength below that of 1890. All three Presidencies participated in the fall, but Bengal most.

Admissions from Venereal Diseases in the three Presidencies.

Presidency.	Admissions per 1,000.										
	1870–79.	1881–90.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
Bengal* - -	209	366	281	291	363	394	356	373	491	504	395
Madras - -	198	367	289	307	350	394	400	376	452	491	402
Bombay* - -	191	339	218	292	272	370	337	357	481	515	417
India† -	203	360	270	294	343	389	361	371	482	504	401

* Excluding troops in Afghanistan during 1881. † Including troops in Afghanistan during 1881.

The year 1884 was the last year in which the Contagious Diseases Acts were in full force. The following table compares the venereal statistics of 1884, 1890, and 1891 :—

Army of India.

Venereal Admissions of 1884, 1890, *and* 1891 *compared.*

Venereal Diseases.	1891.		1890.		1884.*	
	Strength 67,030.		Strength 67,823.		Strength 55,349.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis -	6,971	104·0 } 159·2	9,198	135·6 } 220·7	4,992	90·2
Ulcer of penis -	3,700	55·2 }	5,769	85·1 }		
Secondary syphilis -	4,024	60·0	4,497	66·3	1,352	24·4
Gonorrhœa - -	10,066	150·2 } 181·5	11,725	172·9 } 216·6	8,070	145·8 } 179·0
Other venereal diseases	2,101	31·3 }	2,963	43·7 }	1,835	33·2 }
Total - -	26,862	400·7	34,152	503·5	16,249	293·6

* From Annual Returns.

Regarding only the ratios to the right of the brackets, it appears that all the ratios of 1891, though lower than those of 1890, were higher than those of 1884.

In the Army of Bengal venereal disease caused *directly* 28 per cent. of the admissions, 0·29 per cent. of the deaths, and 11 per cent. of the invaliding. The admission rate fell about 109 per 1,000 of strength below that of 1890. In the Army of Madras venereal disease caused *directly* 31 per cent. of the admissions, 0·52 per cent. of the deaths, and 31 per cent. of the invaliding. The admission rate fell about 89 per 1,000 of strength below that of 1890. In the Army of Bombay venereal disease caused *directly* 30 per cent. of the admissions, no deaths, and 8 per cent. of the invaliding. The admission ratio fell 98 per 1,000 below that of 1890.

Invaliding.

In the whole Army of India 1,793 men were invalided, or 26·78 per 1,000 of average strength, against 1,715 and 25·29 in the preceding year. The ratio for 1891 was 0·57 per 1,000 less than that of the decennium 1881–90, which was 27·35. The proportion of invalids to strength was lowest in Bengal, highest in Madras.

Thirty-four per cent. of the total number invalided were discharged as unfit for further service. This proportion, as may be seen from the following table, was not much out of the common, though rather lower than in former years. In Bengal and Bombay the proportion of discharge was greater than in the previous year, and in Bombay it was high as compared with the past. The proportion was, as usual of late years, highest in Madras; but was there lower than it had been for some years.

Percentage of those invalided for discharge to total number invalided.

	1887.	1888.	1889.	1890.	1891.
Army of India -	37	39	37	35	34
„ Bengal -	41	40	37	33	34
„ Madras -	43	43	46	43	36
„ Bombay -	22	29	25	32	33

The following table shows the diseases which caused invaliding of not less than 1 per 1,000 of strength :—

Bengal.		Madras.		Bombay.	
Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.	Diseases.	Invaliding Rate.
Debility - - -	3·37	Syphilis and gonorrhœa -	9·12	Debility - - -	6·12
Syphilis and gonorrhœa -	2·56	Debility - - -	2·79	Malarial fevers - -	2·98
Malarial fevers - -	2·27	Mental diseases - -	2·11	Syphilis and gonorrhœa -	1·88
Tubercle of lungs - -	1·54	Hepatitis - -	2·03	Other nervous diseases -	1·81
Palpitation - - -	1·27	Dysentery - - -	1·88	Tubercle of the lungs - -	1·65
Injuries - - -	1·17	Malarial fevers - -	1·88	Injuries - - -	1·57
Hepatitis - - -	1·15	Tubercle of the lungs -	1·51	Palpitation - - -	1·26
Mental diseases - -	1·03	Valve disease of the heart -	1·13	Diseases of the ear - -	1·26
Other nervous diseases -	1·03			Mental diseases - -	1·18
				Valve disease of heart -	1·02

Debility and venereal diseases head the list in Bengal and Madras, and debility, malarial fevers, and venereal diseases in Bombay.

There was a decrease in the ratio of invaliding from mental disease in the Army of India, and an increase only in the Army of Madras. There were 48 cases of melancholia, 20 of dementia, and 12 of mania.

The percentage of men who were invalided while under 25 years of age to the whole number invalided was 54·01 for the Army of India against 53·04 in the preceeding year. The percentage of men under 25 in the strength of the Army of India was 51 against 50 in the previous year.

Of the total number of men invalided 30 per cent. were of less than two years' service, and 77 per cent. were of less than five years' service. With this is to be considered the fact that 80 per cent. of all the men in the strength of the army in 1891 were of less than five years' service.

The percentage to total invaliding of invaliding in the first four years of Indian service was 48 in the period 1871–75, 68 in the period 1881–85, 68 in the period 1886–90, and 63 in 1891 ; while the percentage of men invalided in the first four years of service who were under 30 years of age has risen from 73 in 1871–75 to 95 in 1890. Of the men invalided under four years of Indian service in 1891, 72 per cent. were also under 25 years of age.

Statistics of women.

The average strength of women remaining nearly the same, the ratios of sickness and mortality decidedly improved.

Strength, sickness and mortality of women in the Army of India.

Years.	Average Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90 - - -	33,517	837·5	30·6	18·86
1890 - - -	3,130	789·5	29·4	15·02
1891 - - -	3,137	748·8	27·1	14·03

The chief causes of admission were debility, ague, and the diseases peculiar to women. Among the chief diseases which caused increased admission were cholera, simple continued fever, dysentery, and puerperal affections ; while there was a

diminution in influenza, small-pox, respiratory diseases, and rheumatism. The admission ratio from influenza fell from 19·5 to 1·9 In the Bengal Presidency the admission rate from all causes was 679, in Madras 960, and in Bombay 673; Bengal and Bombay showing a decrease, as compared with the previous year, Madras an increase. Comparing the three Presidencies with reference to the incidence of certain diseases, Bengal had the highest ratio for influenza, cholera, enteric fever, ague, and puerperal affections; Madras the highest for respiratory diseases, phthisis, debility, bowel complaints, rheumatism, diseases peculiar to women, and entozoa. The constantly sick-rate was highest in Madras, lowest in Bombay.

The mortality among women was lower than in any year since 1885. The chief causes of death were, in order, puerperal affections, cholera, enteric fever, and diseases of the nervous system. The chief increase of mortality was in cholera, and the chief decrease in circulatory, respiratory, and bowel complaints. In the Bengal Presidency the death rate was 17·30, in Madras 12·63, and in Bombay 6·54; Bombay being the only Presidency that had a lower death-rate than in the previous year, a death-rate less than a third of that of 1890. Comparing the three Presidencies with regard to mortality from certain diseases, Bengal had the highest ratio for cholera, dysentery, hepatic abscess, enteric fever, diarrhœa, and puerperal affections; Madras the highest for remittent fever, heatstroke, and pneumonia; and Bombay the highest for circulatory diseases. Bengal had no deaths from respiratory diseases or tubercle of the lungs; Madras none from bowel complaints, hepatitis, or tubercle of the lungs; Bombay none from fevers, bowel complaints, hepatitis, tubercle of the lungs, respiratory diseases, debility, or puerperal affections. In Bengal the chief increase was in cholera, enteric fever, and puerperal affections; in Madras the chief increase was in fevers; in Bombay the chief decrease was in enteric fever, tubercle of the lungs, and puerperal affections.

Statistics of children.

The decline in the average strength of children continued. Sickness was reduced, but mortality was increased:—

Strength, sickness and mortality of children in the Army of India.

Years.	Average Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90 - - -	62,862	633·5	23·4	50·22
1890 - - -	5,912	564·3	20·3	47·02
1891 - - -	5,886	509·0	19·2	49·27

The chief causes of admission were, in order, ague, respiratory diseases, and debility. The greatest increase of admission was in cholera, "other fevers," eye diseases, &c.; and the greatest decrease in influenza, small-pox, and hepatitis. In the Bengal Presidency the admission rate was 406, in Madras 740, and in Bombay 493; the last being the only Presidency which had a higher ratio than in the previous year.

The mortality among children was higher than it had been since 1888. The chief causes of death were, in order, debility, convulsions, teething, diarrhœa, respiratory diseases, tubercle, dysentery, measles, remittent fever, cholera, and diphtheria or croup. The greatest increase of mortality was in cholera, whooping cough, tubercle of the meninges, pneumonia, and teething; and the greatest decrease in tubercle of abdominal organs, convulsions, and bowel complaints. In the Bengal Presidency the death ratio was 44·33, in Madras 53·16, and in Bombay 57·50; Bengal being the only Presidency which had a lower death-rate than in the previous year, Madras showing the greatest increase, and Bombay the highest death-rate.

Native Troops.

Sickness and mortality in 1891.

The health of the Native Army of India was better than in the preceding year, though the death-rate was still high, there having been an increase of cholera mortality. Influenza was still present, but in greatly reduced amount.

Sickness and Mortality of the periods 1877–81 *and* 1881–90, *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1877–81 -	118,669	1,422	48	1·94	24·90	27·40
1881–90 - -	116,712	1,054	35	1·28	13·44	16·91
1890 - -	127,746	1,137	39	1·83	15·91	18·64
1891 - -	128,600	972	35	2·64	15·44	19·34

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were cholera, bowel complaints, hepatic abscess, scurvy, and rheumatism. Among those with lessened rates were influenza, small-pox, all fevers except enteric, spleen diseases, pneumonia, venereal diseases, and eye diseases. Ague caused 44 per cent. of the total admissions.

The chief causes of death were cholera, pneumonia, remittent fever, ague, respiratory diseases other than pneumonia, injuries, and dysentery. Among the diseases which caused increased mortality were cholera, enteric fever, ague, hepatitis, spleen diseases, respiratory diseases other than pneumonia, and circulatory diseases. Among those from which mortality was lessened were pneumonia, scurvy, bowel complaints, remittent fever, and suicide. Cholera caused 17 per cent. of the total deaths, and pneumonia 16 per cent.

The chief causes of invaliding in the Native army were debility, rheumatism, diseases of the lymphatic system, and respiratory diseases.

If the statistics of Native troops be compared with those of European troops, it will be seen how much less the Native soldier suffered from enteric and simple continued fevers, hepatic affections, circulatory diseases, tonsillitis, heatstroke, and venereal diseases, and how much more he suffered from ague, remittent fever, spleen diseases, dysentery, pneumonia, eye diseases, scurvy, diseases of the integuments, and entozoa, than his European comrade.

Army of Bengal.

The health of the Native Army of Bengal in the year under review improved, though the increased prevalence of cholera prevented the death-rate from sinking to a usual level.

Sickness and Mortality of the ten-year periods 1867–76 *and* 1881–91, *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1867–76 - - - -	39,508	1,360	42	2·12	13·84	17·25
1881–90 * - - - -	55,244	1,200	38	1·15	14·27	18·22
1890* - - - -	64,080	1,306	42	3·28	19·16	21·82
1891* - - - -	66,230	1,021	35	3·73	17·32	18·10

* Including Punjab Frontier Force, but excluding certain men on escort duty in 1891.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were respiratory diseases other than pneumonia, injuries, cholera, enteric fever, phthisis, scurvy, and rheumatism. Among those with lessened rates were influenza, ague, pneumonia,

dysentery, remittent fever, simple continued fever, spleen diseases, and venereal diseases. Ague caused 43 per cent. of the total admissions.

The chief causes of death were cholera, pneumonia, remittent fever, injuries, respiratory diseases other than pneumonia, ague, dysentery, tubercle of the lungs, diarrhœa, and debility. Among the diseases which caused increased mortality were injuries, simple continued fever, respiratory diseases other than pneumonia, cholera, and enteric fever. Among those from which mortality was lessened were dysentery, pneumonia, diarrhœa, scurvy, and remittent fever. Cholera caused over 21 per cent. of the total deaths, and pneumonia 19 per cent.

The chief causes of invaliding were debility and rheumatism.

Corps of Central India and Rajputana.

In all respects the statistics of the corps in Central India and Rajputana were better than in the previous year.

Sickness and Mortality of the ten-year period 1881–90 *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Deaths from All Causes.	Mortality including absent Deaths.
1881–90	5,161	709	21	·43	8·27	9·46
1890	5,118	702	21	·78	9·96	9·96
1891	5,175	629	20	·58	7·73	8·96

The chief causes of admission were ague, injuries, and diseases of the integuments. Among the diseases with raised admission rates were bowel complaints, heatstroke, guineaworm, remittent fever, and venereal diseases. Among those with lessened admission rates were influenza, respiratory diseases, spleen diseases, phthisis, simple continued fever, and cholera. Ague caused 36 per cent. of the total sickness.

The chief causes of death were pneumonia and remittent fever. Among the diseases with increased mortality were remittent fever, heatstroke and injuries. Among those with lessened mortality were respiratory diseases, debility, ague, and cholera. Pneumonia caused 35 per cent. of the total deaths, and remittent fever 20 per cent.

Madras Army.

The health of the Native army of Madras was bad; the admission, constantly sick, and death rates being all higher than any recorded during the previous ten years. This was in great part due to cholera and malarial affections among the troops in Burma.

Sickness and Mortality of the ten-year period 1881–90 *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Deaths from All Causes.	
1881–90	25,960	835	33	1·98	12·99	27·87
1890*	26,032	924	41	·54	15·63	20·64
1891	26,088	1,017	46	1·99	20·05	27·28

* Excluding certain men in the Chin Lushai Expedition.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were cholera, spleen diseases, pneumonia, dysentery, ague, circulatory diseases and guineaworm. Among those with lessened admission rates were influenza, small-pox, "other fevers," simple continued fever, and phthisis. Ague caused 46 per cent. of the total sickness.

The chief causes of death were ague, cholera, debility, dysentery, remittent fever, and diarrhœa. Among the diseases which caused increased mortality were cholera, ague, respiratory diseases, circulatory diseases, and bowel complaints. Among those

from which mortality was lessened were remittent fever and simple continued fever. Ague caused 18 per cent. of the total deaths, cholera 10 per cent., and remittent fever and pneumonia each nearly 8 per cent.

The chief causes of invaliding were debility and rheumatism.

The following table shows the statistics of all the troops serving in Burma and the Andamans. Of these troops the Madras army furnished 83 per cent.

Average Strength.	Ratio per 1,000 of Strength.			
	Admissions into Hospital.	Constantly Sick.	Deaths from	
			Cholera.	All Causes.
11,401	1,676	76	1·75	36·31

Bombay Army.

The health of the Native Army of Bombay markedly improved, though mortality from cholera was higher:—

Sickness and Mortality of the ten-year period 1881–90 *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1881–90 - -	23,140	1,151	38	1·12	14·58	16·74
1890* - -	24,032	1,139	35	·12	10·99	12·92
1891* - - -	23,780	978	31	1·26	9·63	12·34

* Excluding certain men on escort duty.

The chief causes of admission were ague, diseases of the integuments, and injuries. Among the diseases with raised admission rates were cholera, small-pox and enteric fever. Among those with lessened rates were influenza, simple continued fever, and respiratory diseases. Ague caused 46 per cent. of the total sickness.

The chief cause of death were pneumonia, remittent fever, cholera, respiratory diseases other than pneumonia, ague, and dysentery. Amongthe diseases which caused increased mortality were cholera, enteric fever, and malarial fevers. Among those with lessened mortality rates were simple continued fever, pneumonia, injuries, and dysentery. Pneumonia caused 18 per cent. of the total deaths, and cholera and remittent fever each over 13 per cent.

The chief causes of invaliding were debility and respiratory diseases.

Hyderabad Contingent.

The health of the Hyderabad Contingent was not so good as in the preceding year; for though the admission rate was lower, the constantly sick and death rates were considerably increased, and cholera mortality rose from zero to 1·13 per 1,000 of strength.

Sickness and Mortality of the ten-year period 1881–90 *and of the years* 1890 *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				Mortality including absent deaths.
		Admissions into Hospital.	Constantly sick.	Deaths from		
				Cholera.	All causes.	
1881–90 - -	6,673	590	20	·78	6·28	8.11
1890 - -	7,071	553	17	—	4·81	6·71
1891 - - -	7,063	529	9	1·13	6·09	7.83

The chief causes of admission were ague, diseases of the integuments and injuries. Among the diseases with raised admission rates were cholera, bowel complaints, scurvy, circulatory diseases, and malarial fevers. Among those with lessened rates were influenza, "other fevers," respiratory diseases, phthisis, and guineaworm. Ague caused 34 per cent. of the total sickness.

The chief causes of death were cholera, pneumonia, other respiratory diseases, and injuries. Among the diseases which caused increased mortality were cholera, respiratory diseases other than pneumonia, and injuries. Among those with lessened rates were pneumonia and circulatory diseases. Cholera caused 19 per cent. of the total deaths, and pneumonia 16 per cent.

Comparison of corps.

Having considered individually the health statistics of the several portions of the Native Army of India in the foregoing paragraphs, it will now be convenient to contrast the main features of the same; and for ready reference the chief results are brought together in the following table:—

Corps.	Total Deaths per 1,000, including Absentees.	Average Strength present.	Ratio per 1,000.			
			Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Present Deaths from all Causes.
India - - -	19·34	128,600	972	35	2·64	15·44
Bengal Army - - -	18·10	66,230	1,021	35	3·73	17·32
Corps of Central India and Rajputana	8·96	5,175	629	20	·58	7·73
Madras Army - - -	27·28	26,088	1,017	46	1·99	20·05
Bombay Army - - - -	12·34	23,780	978	31	1·26	9·63
Hyderabad Contingent - -	7·83	7,063	529	19	1·13	6·09

As usual, the health of the Hyderabad Contingent and of the Corps of Central India and Rajputana was the best. Sickness and mortality were greatest in the Madras army. The comparison is carried into greater detail in Table VII.

Geographical groups of India.

The new geographical groups adopted have been described in page 45 of this Abstract.

Of the 12 annual ratios of constantly-sick, six were higher than the ratio of India and six lower, the highest ratios being those of the second, third, and first groups, and the lowest that of the tenth. The highest admission ratio was that of the second group, and the lowest that of the eleventh. Burma Coast had the highest admission ratios from circulatory diseases, spleen diseases, and rheumatism; Burma Inland the highest from cholera, ague, and all causes; Assam the highest from small-pox, enteric fever, "other fevers," tubercle of the lungs, diarrhœa, venereal diseases, entozoa other than guineaworm, diseases of the integuments, and injuries; Bengal and Orissa the highest from remittent fever, nervous diseases, tonsillitis, and dysentery; the Indus Valley the highest from pneumonia; Central India the highest from guineaworm; the Western Coast the highest from hepatitis and urinary diseases; Southern India the highest from eye diseases; and the Hill Stations the highest from influenza, simple continued fever, respiratory diseases other than pneumonia and scurvy.

Of the 12 annual ratios of mortality five were higher than the ratio of India, and seven lower, that of the second group being highest, and that of the eighth lowest. Burma Coast had the highest death-rate from injuries; Burma Inland the highest rates from cholera, ague, dysentery, diarrhœa, debility, and suicide; Assam the highest from small-pox enteric fever, heatstroke, and tubercle of the lungs; Bengal and Orissa the highest from remittent fever, circulatory diseases, hepatic abscess, and spleen diseases; the Indus Valley the highest from pneumonia; the Western Coast the highest from hepatitis and urinary diseases; Southern India the highest from nervous diseases; and the Hill Stations the highest from respiratory diseases other than pneumonia, and from scurvy.

Principal diseases: Influenza.

Influenza, though still present in 1891, was very greatly diminished in amount and in generality. It has already been mentioned that in proportion to strength the Hill Stations were most severely affected. The regions where most cases occurred were the Punjab, the North-Western frontier, and the Indus Valley. The disease began in May, and reached its maximum in June, decreased from that in November, and rose again steeply in December. Most of the cases in June occurred at Jhelum, and most of the

cases in December at Bhuj. The admission-rate in the Native army was 7·0 per 1,000 of strength, the mortality 0·09 per 1,000, of strength, and the fatality 1·33 per cent. of cases treated, against respectively, 64·3, 0·41, and 0·63 in 1890. The following table shows that the natives were more severely affected than the European troops, less severely than the prisoners, It shows also how both sickness and mortality from pneumonia were diminished in all three bodies; and how in all three admission from ague, simple continued fever and all causes decreased:—

	Per 1,000 of Average Strength.											
			Increase or Decrease as compared with 1890.									
	Influenza.		Pneumonia.		Other Respiratory Diseases.		Simple, continued Fever.		Ague.		All causes.	
	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.
European Troops	5·5	·04	−2·0	− ·36	−3·5	−0·3	−12·7	—	−10·6	+0·2	−141·1	+2·05
Native Troops	7·0	·09	−5·1	−1·43	+ .6	+·37	− 7·0	−·04	−19·4	+3·3	−164·9	− ·47
Prisoners	19·0	·29	−1·6	− ·84	+3·5	+1·08	− 7·7	−·02	77,136·3	−·07	−189·1	+ ·40

Cholera. Most cases of cholera occurred in April and May, when Manipur, Assam, and Upper Burma were specially affected. In the second half of the year the disease was more scattered. The admission-rate was 4·5 per 1,000 of strength, the death-rate 2·64 per 1,000 of strength, and the fatality 56·77 per cent. of cases treated, against respectively, 2·9, 1·83, and 61·29 in 1890.

Fevers. To fevers returned as malarial were due 45 per cent. of the sickness and 19 per cent. of the mortality of the Native army. The admission ratio per 1,000 of strength from these fevers fell in 1891, while the death-ratio rose.

The ratio of admission from enteric fever in the Native army in 1891 was 0·3 per 1,000 of strength. Since, at least, 1880 this ratio has never been higher than 0·3, and has usually been 0·2. In the same period the extreme mortalities were 0·14 and 0·04. The mortality in 1891 was 0·13, as against 0·07 in 1890. The following table shows that the ratios for European troops are very unlike those for Native troops and prisoners:—

Admission and Death-rates per 1,000 *from* Enteric Fever *in the European Troops, Native Troops, and Jails of India compared.*

	1877 to 1886.		1891.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops	8·9	3·15	20·4	5·76
Native troops	·2	·10	·3	·13
Jail population	·2	·10	·2	·08

Post-mortems are rarely obtained in the case of Native soldiers; but among prisoners nearly every fatal case of disease is subjected to *post-mortem* examination. Under these circumstances the fact that the ratios of prisoners and sepoys for a ten-year period are practically identical appears to show that the Native troops really suffer less than the European. Again, the following table shows that the fever mortality in the European and Native armies is not the same in amount:—

Fever Mortality of Native Troops compared with that of European Troops in 1891.

Causes of Deaths.	Died per 1,000 of average Strength.		Relative Liability in Percentages.			Percentage in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total=100.	European Troops.	Native Troops.
Ague	·18	1·32	12·0	88·0	100	1·1	8·6
Remittent fever	·42	1·57	21·1	78·9	100	2·6	10·2
Simple continued fever	·10	·09	10·0	90·0	100	·1	·6
Enteric fever	5·76	·13	97·8	2·2	100	36·2	·9
Total	6·37	3·11	67·2	32·8	100	40·0	20·3

The total fever mortality among the Native troops in 1891 was to the total fever mortality among European troops as 1 : 2·0. For the period 1877—86 the corresponding ratio was 1 : 1·4, and for 1890 it was 1 : 1·9. Again, among European troops 40 per cent. of all deaths in 1891 were from fevers: only 20 per cent. among Native troops. It appears, then, that Native soldiers and prisoners are less liable to contract enteric fever than Europeans are. The possible causes of this have been discussed in previous reports, and no new light has been thrown on the subject during the year under review.

In the whole Native army of India, 35 cases with 17 deaths were returned as enteric fever, as against 18 with 9 in 1890. Of the deaths nine were in the Bengal army, two in the Madras army, five in the Bombay army, and one in the Hyderabad Contingent.

Dysentery.

From dysentery the admission-rate was higher, but the death-rate lower, than in the preceding year; the former by 1·8 and the latter by 0·24 per 1,000 of strength. On comparing the tables for European troops with those for Native troops, it will be seen that the death-rate of Natives from dysentery was to that of Europeans as 1·9 : 1, and that dysentery caused 5·6 per cent. of all the deaths of Native soldiers, but only 2·8 per cent. of the deaths of European soldiers. In 1890 these percentages were respectively 7 and 5.

Respiratory diseases.

The following table shows the ratios of admission and mortality from respiratory diseases in the principal divisions of the Native army :—

Period.	Ratio per 1,000 of Strength.											
	India.		Bengal.*		Corps of Central India and Rajputana.		Madras.		Bombay.		Hyderabad Contingent.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1881–85	56	4·24	56	4·15	38	3·37	27	1·53	91	6·73	25	1·40
1886	51	3·68	51	3·28	34	2·10	28	1·99	81	7·11	23	·94
1887	45	3·08	49	*3·57	29	1·88	20	1·20	69	4·42	22	·99
1888	39	2·68	41	*3·70	22	1·53	22	1·01	59	2·50	22	·96
1889	42	3·14	45	*4·03	43	2·71	25	1·79	58	2·55	26	2·59
1890	55	4·62	60	*6·24	41	4·89	32	1·65	78	4·37	25	1·69
1891	50	3·56	61	*4·63	32	3·29	36	2·07	50	2·74	20	1·98

* Including Punjab Frontier Force.

Except in the case of Bengal and Madras, the ratios were considerably more favourable than in the previous year. This was probably due to the diminution of influenza. Decrease was greatest in the case of Bombay, and increase in the case of Madras. All the corps ratios, though still high, compare favourably with the preceding year. The highest mortality from respiratory diseases other than pneumonia was in the Hill Stations.

The following table gives the admission and death-rates per 1,000 from pneumonia in 1891, and shows a general improvement, except in the case of Madras:—

Period.	India.		Bengal.		Corps of Central India and Rajputana.		Madras.		Bombay.		Hyderabad Contingent.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1890 - -	16·7	3·96	22·4	5·40	17·6	3·91	4·0	1·38	16·8	3·79	7·8	1·41
1891 - - -	11·6	2·53	14·9	3·35	12·4	2·71	7·2	1·53	9·5	1·77	3·7	·99

Then follows a table from which may be seen at a glance the incidence of mortality from pneumonia in the various geographical groups:—

Deaths from Pneumonia.

	Groups.												
	Burma Coast and Bay Islands.	Burma Inland.	Assam.	Bengal and Orissa.	Gangetic Plain and Chutia Nagpur.	Upper Sub-Himalayan.	Indus Valley and N. W. Rajputana.	S. E. Rajputana, Central India and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	Army of India.
Death-rates per 1,000 of average annual strength.	2·84	1·69	3·71	·64	1·98	2·77	6·08	1·78	1·58	·54	1·29	4·29	2·53
Percentages in total deaths.	14·0	4·2	15·1	3·9	22·2	23·2	41·5	25·0	20·6	6·9	16·9	24·1	16·4

It shows well the high mortality from pneumonia in the Indus Valley, and next to that in the Hill Stations. It also shows the high percentage of pneumonia to the total death-causes in those regions. Again, from the following it may be gathered that in 1891 the mortality of Native soldiers from pneumonia was more than four and a half times as great as that of European soldiers.

Cause of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentages in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total =100.	European Troops.	Native Troops.
Pneumonia - -	·54	2·53	17·6	82·4	100	3·4	16·4

Venereal diseases.

The following statements are given to correspond with those already given for European troops. The first shows that the venereal ratio for India of 1891 was somewhat lower than that of 1890; and that the ratios of the armies of Bengal, Madras, and Bombay, were reduced, while the ratios of the two smaller corps were raised.

Venereal Disease in the Native Army of India.

Corps.	Admission per 1,000 of Strength.			
	1866.	1884.	1890.	1891.
Bengal Army - - -	47·6	31·3	39·7*	35·5*
Corps of Central India and Rajputana	59·3	18·1	19·3	21·1
Madras Army - - -	22·6	22·6	48·9	42·7
Bombay Army - - -	No record	32·1	47·5	47·0
Hyderabad Contingent -	No record	16·4	19·7	23·6
India - - - -	Incomplete	27·9†	41·4†*	37·9*†

* Including Native drivers of European batteries. † Including mixed troops of Bengal, Madras, and Bombay.

The second shows, taking the figures to the right of the brackets, that, while secondary syphilis remained the same, the other ratios were reduced.

Venereal Diseases.	1884.* Strength 127,477.		1890. Strength 127,746.		1891. Strength 128,600.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis	1,266	9·9 } 9·9	1,442	11·3 } 16·0	1,206	9·4 } 13·6
Ulcer of penis	—	— }	604	4·7 }	548	4·3 }
Secondary syphilis	609	4·8	883	6·9	887	6·9
Gonorrhœa	959	7·5 } 10·1	1,527	12·0 } 18·1	1,377	10·7 } 17·3
Other venereal diseases	333	2·6 }	788	6·2 }	853	6·6 }
Total	3,167	24·8	5,244	41·1	4,871	37·9

* From Annual Returns and excluding Native drivers of European batteries.

The third shows that the ratios of both European and Native troops for 1891 were lower than the corresponding ratios of 1890; that in the case of both European and Native troops in 1891 the Bombay army was worst, and the Bengal army best; and that in all cases, as usual, the ratios of the European troops were higher than those of the Native troops.

A Comparative Summary of Venereal Disease in the European and Native Armies.

	1884. European Troops.		1884. Native Troops.		1890. European Troops.		1890. Native Troops.		1891. European Troops.		1891. Native Troops.	
	Admissions.	Ratio per 1,000 of Strength.	Admissions.	Ratio per 1,000 of Strength.	Admissions.	Ratio per 1,000 of Strength.	Admissions.	Ratio per 1,000 of Strength.	Admissions.	Ratio per 1,000 of Strength.	Admissions.	Ratio per 1,000 of Strength.
Army of Bengal	9,731	290·6	1,608	31·3	20,840	504·0	2.545	39·7	16,203	395·3	2,354	35·5
Army of Madras	3,308	306·7	635	22·6	6,733	491·2	1,272	48·9	5,357	402·1	1,115	42·7
Army of Bombay	3,127	291·6	750	32·1	6,579	515·5	1,141	47·5	5,302	417·1	1,118	47·0
Army of India	16,166	293·9	3,200	27·9	34,152	503·5	5,244	41·1	26,862	400·7	4,871	37·9

The fourth, again, shows that the secondary syphilis of Native troops underwent neither increase nor decrease, and that it runs at an altogether lower level than the secondary syphilis of European troops.

Comparison of the Secondary Syphilis Ratios of the European and Native Armies.

	1884.	1890.	1891.
European troops	24·4	66·3	58·5
Native troops	4·8	6·9	6·9

It is, of course, but natural that the ratios of the Native troops should be much less than those of the European troops, considering the very different environment of the two bodies of men.

Jails.

Sickness and mortality in 1891.

There was an increase, as shown in the subjoined table, of the average jail population in 1891. The admission and constantly sick rates were substantially reduced; but though the mortality from bowel complaints was lowered, the general death-rate was raised, principally owing to a decided increase in cholera mortality. The mortality from bowel complaints was unusually low, lower even than in the preceding year.

Statement showing the Strength, Sickness, and Mortality among the Prisoners of India during the years 1872–76, 1877–81, 1881–90, 1890, *and* 1891.

Year.	Average Strength.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
1872–76	99,758	1,016	?	2·86	13·48	36·24
1877–81	112,670	1,189	45	4·48	24·97	63·01
1881–90	89,978	1,113	39	2·91	11·72	34·96
1890*	96,610	1,232	40	1·44	8·98	31·49
1891†	101,019	1,043	37	3·09	8·42	31·89
* Including the subsidiary jails 99,324		1,226	39	—	—	31·10
† Including the subsidiary jails 104,435		1,046	37	—	—	31·50

The chief causes of admission were ague, dysentery, abscess, ulcer and boil, and diarrhœa. Among the diseases with raised admission-rates were cholera, bowel complaints, debility, and heatstroke. Among those from which admission-rates were lower were influenza, malarial fevers, pneumonia, hepatic affections, scurvy, and abscess, ulcer and boil. Ague caused 37 per cent. of the total sickness, and bowel complaints 16 per cent. The chief causes of death were, in order, dysentery, pneumonia, cholera, diarrhœa, other respiratory diseases, debility, remittent fever, injuries, and tubercle of the lungs. Among the diseases which caused increased mortality were cholera, heatstroke, respiratory diseases other than pneumonia, and injuries. Among those from which mortality was lessened were pneumonia, scurvy, phagedæna and bowel complaints. Bowel complaints caused 26 per cent. of the total deaths, respiratory diseases 23 per cent., and cholera 10 per cent.

The following statement shows for each administration the proportion of prisoners to each 10,000 of the population :—

Ratio of Prisoners per 10,000 *of Population in each of eight Administrations for* 1890 *and* 1891. (*Burma not available; Andamans excluded.*)

Presidency.	Years.	General Population, according to Census of 1891.	Prisoners.		
			Average Number.*	Proportion to 10,000 of Population.	Deaths per 1,000 of Average Strength.
Assam	1890	5,021,084	1,432	2·8	35·61
	1891		1,322	2·6	63·54
Bengal	1890	70,368,267	14,778	2·1	32·35
	1891		15,917	2·3	30·97
N.-W. Provinces and Oudh	1890	46,905,085	25,066	5·3	33·83
	1891		28,268	6·0	27·63
Punjab	1890	20,553,982	12,586	6·1	30·91
	1891		12,439	6·1	28·38
Bombay	1890	18,820,346	7,576	4·0	32·34
	1891		7,543	4·0	32·48
Berar	1890	2,840,406	992	3·5	18·15
	1891		1,065	3·7	11·27
Central Provinces	1890	8,817,185†	4,452	5·0	26·06
	1891		4,675	5·3	30·37
Madras	1890	30,835,771†	8,927	2·9	23·75
	1891		9,779	3·2	35·08

* Including subsidiary jails. † Census of 1881.

The following table shows the proportion in which some of the principal diseases entered into the composition of 100 deaths in each administration:—

Causes of Death.	Composition of 100 deaths.									
	Andamans.	Burma.	Assam.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Bombay.	Berar.	Central Provinces.	Madras.
Cholera	—	15·0	14·9	11·4	12·7	3·4	1·2	—	—	25·8
Fevers	10·6	7·5	1·4	12·5	5·9	15·8	9·4	8·3	8·5	6·0
Pneumonia	4·8	10·1	9·5	13·3	15·9	31·0	34·2	16·7	20·4	4·7
Dysentery and diarrhœa	31·5	25·7	47·3	28·3	26·6	16·7	14·8	16·7	33·8	28·6
Tubercle of the lungs	2·3	4·6	—	4·4	5·3	4·6	2·1	—	1·4	2·2
Anæmia and debility	9·6	3·2	5·4	4·4	6·6	1·7	4·9	16·7	4·2	6·6
All causes	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

The Andamans had the highest mortality from debility, and, as usual, no cholera; Assam the highest mortality from cholera and bowel complaints, but no deaths from tubercle of the lungs; the North-Western Provinces and Oudh the highest mortality from tubercle of the lungs; the Punjab the highest mortality from fevers; Bombay the highest mortality from pneumonia; Berar the lowest mortality from bowel complaints, and no deaths from tubercle of the lungs; and Madras the lowest mortality from pneumonia.

In the Andamans, while the constantly sick rate (59 per 1,000) remained unchanged, a considerably lowered admission-rate (from 1,978 in 1890 to 1,588) was accompanied by a considerably raised death-rate (from 34·62 to 41·47). The mortality from bowel complaints was high. The chief cause of the increased death-rate was injury or exposure during the severe cyclone in November, many of the deaths being out of hospital. The chief causes of admission were ague, dysentery, abscess, and respiratory diseases other than pneumonia. The admission rates from bowel complaints and heatstroke were raised; while those from malarial fevers, respiratory diseases, scurvy, and abscess were lowered. The settlement remained free from cholera, and, as to the prisoners, from influenza. Ague caused 49 per cent. of the total sickness. The chief causes of death were dysentery, respiratory diseases other than pneumonia, remittent fever, and debility. The mortality from dysentery, debility, and phthisis was raised; while that from remittent fever, pneumonia, and slough was lowered. Dysentery caused 27 per cent. of the total deaths, and pneumonia 5 per cent.

Sickness in the Burma jails continued to decrease (the constantly sick rate having fallen from 38 in 1890 to 35 per 1,000), but the death-rate owing to the prevalence of cholera rose from 28·26 to 30·23. The chief causes of admission were simple continued fever, ague, dysentery, abscess, eye diseases, and diarrhœa. The admission rates from cholera, respiratory diseases, bowel complaints, heatstroke, and abscess were raised; while those from influenza, malarial fevers, phthisis, and scurvy were lowered. Simple continued fever caused 17 per cent. of the total sickness, and ague 11 per cent. The chief causes of death were dysentery, cholera, pneumonia, diarrhœa, and remittent fever. The mortality from cholera and remittent fever was raised, while that from phthisis, pneumonia, dysentery, debility, and slough was lowered. Dysentery caused 16 per cent. of the total deaths, cholera 15 per cent., and pneumonia 10 per cent.

The ratios of sickness and mortality show a great deterioration in the health of the prisoners of Assam. The constantly sick rate rose from 50 per 1,000 in 1890 to 70, and the death-rate from 37·16 to 66·91. This was due to cholera and malaria affecting prisoners *en route* while being withdrawn from the Lushai Hills Jail on account of the Manipur outbreak. The chief causes of admission were ague diarrhœa, dysentery, and abscess. The admission rates from cholera, malarial fevers, bowel complaints, scurvy, phthisis, and heatstroke were raised; while those from influenza, respiratory diseases, and abscess were lowered. Ague caused 40 per cent. of the total sickness. The chief causes of death were dysentery, diarrhœa, cholera, pneumonia and debility. The mortality from cholera, dysentery, debility, and phthisis was raised, while that from remittent fever and pneumonia was lowered. As in the preceding year, there were no deaths from sloughing disease. Dysentery caused 30 per cent. of the total deaths, cholera 15 per cent., and pneumonia 9 per cent.

The health of the prisoners of Bengal continued to improve. With the exception of the cholera death-rate, all the ratios were lower than in any other year. The constantly sick rate was 39 per 1,000, against 40 in 1890, and the death-rate 31·39 against 32·99. The chief causes of admission were ague, dysentery, diarrhœa, and simple continued fever. The admission ratios from respiratory diseases, cholera, phthisis, heatstroke, scurvy, and abscess were raised, while those from influenza, malarial fevers and bowel complaints were lowered. Ague caused 31 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, and cholera. The mortality from cholera, remittent fever, and pneumonia was raised, while that from bowel complaints, phthisis, debility, and slough was lowered. Dysentery caused 22 per cent. of the total deaths, pneumonia 13 per cent., and cholera 11 per cent.

The health of the prisoners of the North-Western Provinces and Oudh showed a marked improvement as compared with the previous year, except in cholera mortality. The constantly sick rate fell from 36 to 34 per 1,000, and the death-rate from 33·82 to 27·83. The chief causes of admission were ague, abscess, and dysentery. The admission rates from respiratory diseases, cholera, and phthisis were raised, while those from influenza, malarial fevers, bowel complaints, heatstroke, and abscess were lowered, and the admission rate from scurvy remained unaltered, Ague caused 33 per cent. of the total sickness. The chief causes of death were dysentery, pneumonia, and cholera. The mortality from cholera, phthisis, and debility was raised, while that from pneumonia, bowel complaints, and remittent fever, was lowered, As in the previous year, there were no deaths from sloughing. Dysentery caused 17 per cent. of the total deaths, pneumonia 16 per cent., and cholera 13 per cent.

The health of the Punjab prisoners improved, but there was some increase of cholera mortality. The constantly sick rate was 40 per 1,000, or seven less, and the death-rate declined from 31·29 to 28·31. The chief causes of admission were ague, abscess, diarrhœa, dysentery, and respiratory diseases other than pneumonia. The admission rates from cholera, respiratory diseases, bowel complaints, scurvy, phthisis, and heatstroke were raised, while those from influenza, malarial fevers, and abscess were lowered. Ague caused 57 per cent. of the total sickness. The chief causes of death were pneumonia, dysentery, and remittent fever. The mortality from cholera, remittent fever, and debility was raised, while that from respiratory diseases, bowel complaints, and phthisis was lowered. As in the previous year, there were no deaths from sloughing disease. Pneumonia caused 31 per cent. of the total deaths, dysentery 12 per cent., and cholera 3 per cent.

In the Bombay jails all the ratios showed improvement, except the general death-rate. The death-rate was raised from 32·81 in 1890 to 33·45 by respiratory disease after influenza in the cold weather. The chief causes of admission were ague and abscess. The admission rates from influenza, heatstroke, scurvy, and abscess were raised, while those from malarial fevers, respiratory diseases, bowel complaints, and phthisis were lowered, and the ratio of cholera remained unaltered. Ague caused 27 per cent. of the total sickness. The chief causes of death were pneumonia, other respiratory diseases, remittent fever, dysentery, and diarrhœa. The mortality from phthisis, pneumonia, and remittent fever was raised, while that from cholera, bowel complaints, debility, and slough was lowered. Pneumonia caused 34 per cent. of the total deaths, dysentery 7 per cent., and cholera 1 per cent.

The health of the prisoners of Berar showed a great improvement. The constantly sick rate decreased from 21 to 14 per 1,000, and the death-rate from 18·16 to 11·29. The chief cause of admission was ague. The admission ratios from bowel complaints and scurvy were raised, while those from malarial fevers, respiratory diseases, phthisis, and abscess were lowered. As in the previous year, neither cholera nor heatstroke occurred. Ague caused 43 per cent. of the total sickness. The chief causes of death were circulatory diseases, pneumonia, and debility. The mortality from debility was raised, while that from respiratory diseases, bowel complaints, and phthisis was lowered. As in the preceding year, no deaths occurred from cholera, remittent fever, or sloughing. Pneumonia caused 17 per cent. of the total deaths, and dysentery 8 per cent.

In the jails of the Central Provinces sickness was diminished, the constantly sick rate being 28 per 1,000 against 31 in 1890, but mortality was increased, the ratio being 30·37 against 26·06. There was an increase in mortality from bowel complaints, but, as in the preceding year, no mortality from cholera. The chief causes of admission were ague, diarrhœa, dysentery, and abscess. The admission-rates from phthisis,

pneumonia, heatstroke, and cholera were raised, while those from influenza, malaria, fevers, bowel complaints, scurvy, and abscess were lowered. Ague caused 39 per cent. of the total sickness. The chief causes of death were pneumonia, dysentery, and diarrhœa. The mortality from remittent fever, pneumonia, and phthisis was raised, while that from cholera, dysentery, debility, and sloughing was lowered. Pneumonia and dysentery each caused about 20 per cent. of the total deaths.

Among the Madras prisoners the constantly sick rate (28 per 1,000) diminished by 4 per 1,000 as compared with the previous year, but, from the prevalence of cholera the death-rate rose from 25·32 to 38·25. The chief causes of admission were diarrhœa, ague, and dysentery. The admission-rates from cholera and bowel complaints were raised, while those from influenza, remittent fever, respiratory diseases, phthisis, heatstroke, scurvy, and abscess were lowered. Diarrhœa caused nearly 20 per cent. of the total sickness, and ague 14 per cent. The chief causes of death were cholera, diarrhœa, dysentery, and debility. The mortality from cholera, bowel complaints, and remittent fever was raised; while that from pneumonia, phthisis, and debility was lowered. As in the preceding year, there was no mortality from sloughing. Cholera caused 26 per cent. of the total deaths, diarrhœa 15 per cent., dysentery 13 per cent., and pneumonia 5 per cent.

General Population.

Comparison of the returns from the different Provinces.

The highest provincial birth-rates were returned by the Central Provinces (43·09) and Berar (42·8), but in the former the ratio has been calculated on the population of 1881. In the remaining provinces the birth-rate ranged from 19·8 in Mysore to 36·27 in Bombay. The number of males born to every hundred females was greatest in the Punjab (114) and least in Coorg (103). The excess of births over deaths was greatest in Bombay (9·01 per 1,000 of population), and in the Central Provinces (7·55). There was an excess of deaths over births recorded in three provinces, viz., Bengal, Assam, and Coorg. The mean provincial death-rate ranged from 14 in Mysore to 40 in Berar.

The following statement shows the deaths recorded from all causes month by month in the different provinces :—

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1891.	1890.
Bengal - - -	143,505	137,555	168,192	161,991	125,986	140,597	121,987	142,157	149,433	149,167	216,770	238,921	1,896,261	26·94	24·48
Assam - - -	10,947	9,714	10,951	14,084	17,105	14,168	12,654	11,309	11,556	12,289	13,079	12,310	150,156	29·91	29·64
North-Western Provinces and Oudh.	113,728	101,116	85,763	101,855	131,484	132,864	133,538	104,330	116,917	141,370	149,014	148,753	1,460,732	31·14	37·27
Punjab - - -	51,306	42,665	36,661	32,456	43,879	49,344	68,327	45,731	50,548	59,675	58,555	59,642	598,789	29·13	46·87
Central Provinces - -	20,481	18,607	19,187	22,091	26,654	30,542	24,945	25,667	30,285	36,456	32,576	25,873	313,364	35·54	32·52
Berar - - -	6,312	4,927	5,122	6,192	7,599	7,037	7,267	15,134	20,508	16,997	10,364	8,099	115,558	40·6	35·4
Lower Burma - -	5,792	4,536	4,581	5,102	5,348	5,583	7,083	8,249	7,012	6,880	6,482	6,542	73,190	15·93	17·40
Madras Presidency -	62,441	51,314	46,530	47,663	49,302	52,617	63,956	73,333	64,507	63,139	75,216	97,535	747,553	26·2	22·8
Bombay Presidency -	39,201	34,493	35,120	39,674	39,891	38,179	41,024	47,207	48,313	43,636	44,477	61,917	513,132	27·26	28·18
Mysore - - -	5,973	5,254	4,639	5,220	5,375	5,838	6,364	6,294	5,775	5,652	5,540	6,055	67,979	14·03	20·77
Coorg - - -	272	265	204	265	334	405	423	379	280	299	327	318	3,771	21·79	26·32
Total - -	459,958	410,446	416,950	436,593	452,957	477,164	487,568	479,790	505,134	535,560	612,400	665,965	5,940,485		

In Bengal the registration of births was limited in the year under review to 141 towns in which 58,317 births were recorded, giving a birth-rate of 21·46 per 1,000 of the population. The ratios for the different towns ranged from 44·57 to 2·95, and were below 10 in 14 towns; between 10 and 20 in 48; between 20 and 30 in 58; between 30 and 40 in 20; and above 40 in only one. Male births were to female births in the proportion of 110 to 100, the disparity being attributed to the neglect of registration in the case of females. In most of the towns the recorded births are fewer than the deaths, though the Census shows that the population of these towns as a whole has increased at the rate of 92 per 1,000 in the ten years since the last

Census. This increase is not, however, equal in the two sexes, that of the female population being comparatively small. The Sanitary Commissioner remarks: "The "excess of deaths over births in so many towns is not easily explained. There is no "doubt that it is largely due to defective registration of births, but it is probable that "other causes also helped to bring about this result, viz., a disproportion of the sexes "in some places, and general unhealthiness as indicated by a high death-rate in others. "I am also convinced from personal investigation that even in the most advanced "municipalities the work of registration has been very much neglected."

Since the close of the year the duty of collecting vital statistics has been transferred from the municipalities to the town police. Birth registration has also been again made general over rural as well as town circles as in other provinces.

Deaths were registered throughout the province in both rural and urban circles, and the provincial death-rate for the year was 26·94, as against 22·91 in 1890, calculating on the 1891 census population in both cases. The higher rate in the year under review is not, the Sanitary Commissioner thinks, "due to better registration, although "that may have improved to some extent, but it is to be attributed to greater "unhealthiness as indicated by an abnormally high rate of mortality from cholera and "fever in most of the districts." The death-rates in the different towns ranged from 93·82 per 1,000 to 9·46; and in districts, exclusive of the towns, from 45·14 to 16·2. The provincial death-rate amongst infants under one year of age was 132·95 per 1,000, against 113 in 1890; and among children from one to five years of age, 37·11 against 27·53. The death-rates in the town of Calcutta among children at these ages were 392·64 and 61·02 respectively, and there is little doubt that the provincial rates, though improved, are considerably below the truth.

In the North-Western Provinces and Oudh 191,280 fewer births were recorded than in the previous year, which decrease the Sanitary Commissioner attributes to the excessive mortality in the previous year. The provincial birth-rate for the year was 33·26, compared with 37·38, the corrected rate for 1890. The district birth-rate ranged from 40·51 in Pilibhit to 18·32 in Dehra Doon, and was below 30 in ten of the 49 districts. In municipalities the birth-rate ranged from 57·27 it Fatehpur Sikri to 17·41 in the town of Dehra Doon. Of the 101 municipalities 20 recorded a birth-rate under 30, and 28 a rate over 40 per 1,000. The recorded deaths were fewer by 183,295 than in 1890, the death-rate being 31·14, compared with 35·1, the corrected rate for the previous year. The lessened mortality is explained by the absence of epidemic fevers, in the marked form of the previous year, the epidemic of influenza having practically disappeared, and autumnal fevers being much less prevalent. The highest death-rate in any district was 47·0 in Sultánpur, where cholera was prevalent; the lowest was 20·31 in the Dehra Doon district. The general death-rate of towns was 36·46, compared with 30·75, the rate for the districts exclusive of the towns. The death-rate for infants was 204·1, which is lower than in any previous year. In 20 districts the recorded deaths were in excess of the births. The recorded death-rate among "Christians" was only 8·5, but it is probable that death among Native Christians are often recorded under other religious denominations.

In the Punjab the number of recorded births was considerably below the average of previous year, and the birth-rate was 34 per 1,000. The decrease is attributed by the Sanitary Commissioner to the excessive sickness that prevailed in the last four months of the previous year, but in three of the four districts in which there was excessive mortality in the autumn of 1890, the birth-rate for 1891 was higher than the provincial birth-rate. The district birth-rates ranged from 39·9 in the Sialkot district to 15·9 in the Peshawar district. Low birth-rates were again recorded in the frontier districts. For every 100 female there were 114 male births registered, and the Peshawar district is again pre-eminent in this respect with a record of 162 male to every 100 female births. Whereas in 1890 the death-rate exceeded the birth-rate by 7·79 per 1,000, in 1891 the birth-rate was 4·89 per 1,000 greater than the death-rate. The death-rate was in excess of the birth-rate in eight districts. The death-rate for the province was 29·13 per 1,000, slightly less than the average of the previous five years if this is calculated on the population of 1891. The highest death-rate (41·98) was recorded in the Delhi district, and the lowest (20·24) in Hazara. The death-rate was above the average in January and February, a continuation of the unhealthiness at the end of the previous year, and was very abnormal in July; the result of an epidemic of influenza which beginning in May reached its height in July. In the autumn months the mortality was very much below the average, the result of less malarial fever, which is attributed to an unusually small rainfall. The

provincial death-rates for males and females show an unusual equality, being respectively 29·08 and 29·2; but the female mortality is in excess of the male in 14 districts. In the Delhi, Jullundur, and Ludhiana districts the female death-rates were respectively 4·15, 3·02, and 2·33 per 1,000 greater than the male; but in the Sialkot district, contrary to the experience of the previous year, the male death-rate was in excess. Among infants the female mortality was as usual excessive in the Jullundur and Amritsar districts, and this was the case also, in a less degree, in Ludhiana and Ferozpore.

The rural birth-rate was 33·88 and the death-rate 28·65, against 35·7 and 35·5 respectively in towns. The highest birth-rates in towns were 46 in both Jullundur and Sonepat; the lowest, 26, in Gujrat and Kohat. The highest death-rate, 49·69, was recorded at the town of Sadhaura; the lowest, 23·79, at Chunian.

In the Central Provinces the number of births registered was greater than in any year since 1881 except 1885, and exceeded the record for 1890 by 41,274. The district birth-rates, calculated on the census figures of 1881, ranged from 54·45 in the Nimar district to 35·58 in the Saugor district. There was an increased birth-rate in all the districts. The excess of male over female births was 6·74 per cent. for the province as a whole. The births exceeded the deaths in 14 of the 20 districts. The total number of deaths registered was greater than in any year except 1889, but the death-rate ranged from 46·84 in the Hoshangabad district to 25·65 in Bilaspur. The birth-rate in the *sadar* towns ranged from 53 to 21; the death-rate from 63 to 18. The number of persons fined under the municipal bye-laws for not registering births was 3,003, or 515 more than in 1890; but the total amount of the fines was R.3,573, or R.462 less than in the previous year. The percentage of the total deaths in infants under one year was 30; in children under five years, including infants, 45.

In Berar the provincial birth-rate was 42·8, which is higher than in any year since 1868 except 1885. In the six districts the birth-rate ranged from 47·6 in the Akola district to 34·8 in Wun. The birth-rate for the towns of the province as a whole was 40·5, and ranged from a maximum of 61·7 at Jamod to a minimum of 27·6 at Basim. In three of the thirty-three towns the birth-rate was over 50; in 18 between 40 and 50; in nine between 30 and 40; and in three below 30. The three towns returning birth-rates below 30 are among the largest of the municipal towns. In these towns the reporting of domestic occurrences is compulsory, but in no instance has any prosecution been undertaken to enforce the law. The Sanitary Commissioner says that in testing the registers at Amraoti, which is one of the towns in question, 12 out of 25 infants in arms could not be traced in the register; at another town, Akola, seven births out of 50 had been omitted; while at a third, Basim, five out of 55 were wanting. The birth-rate amongst the rural population as a whole equalled 43·1, and ranged in the different circles of registration from 70·1 to 23·4. For every 100 females 106·5 male births were registered. The proportion of still-births to live-births was 4·2 per cent. The provincial death-rate was 40·6, and the district rates range from 47·6 in Akola to 30·0 in Wun. Male deaths preponderated in every district, and in the province as a whole there were 109·5 deaths among males to every 100 in females. The death-rate for towns was 40·9, and ranged from 64·0 to 22·3. The mortality was, as usual in this province, highest in September, October, and August, the rise in sub-soil water during the rainy season being accompanied by increased mortality. The death-rate amongst children under five years of age was 108·3; and in infants under one year, 301·9 per 1,000.

In the Bombay Presidency, including Sind, the number of births recorded in 1891 exceeded that in 1890 by 41,562, and the birth-rate, calculated on the population of 1891 census, equalled 36·27 per 1,000. The birth-rate in the different collectorates ranged from 45·26 in Ahmednagar to 18·86 in the city of Bombay. The birth-rate exceeded 40 per 1,000 in 11 of the 24 collectorates, and the number of recorded births was higher than in 1890 in all but five of them. In the province as a whole there were 108·1 male births for every 100 females, but this proportion was exceeded in seven collectorates, the maximum figure being 131·77 in Hyderabad. The rural was higher than the urban birth-rate in all the collectorates except seven. Of the rural registration circles eleven returned a birth-rate of over 50 per 1,000; 90 a rate between 40 and 50; and 67 a rate between 30 and 40; while in 38 circles it was between 20 and 30, and in 16 below 20. Of these last 16, as many as 14 are in Sind, where registration is more defective than in the Bombay Presidency proper. Among towns the

birth-rate ranged from 56·92 at Sangamner to 12·43 at Thana, and was below 20 in five. The percentage of still-births to children born alive was 0·90 in the whole province; 9·15 in the city of Bombay; and 4·74 in Kanara. The total number of deaths recorded is greater by 49,516 than in 1890, and the death-rate equals 27·26. The ratios ranged from 42·11 in the Broach collectorate to 14·9 on the Sind frontier. In the city of Bombay the death-rate was 29·15, or 10·29 in excess of the birth-rate. There were 106·64 deaths among males for every 100 among females in the whole presidency, but the proportion is exceeded in many of the collectorates, the maximum being 132·25 in Thar and Parkar. The deaths among children under five years of age formed 43·79 per cent. of the total deaths; those in children less than one year old, 22·18 per cent. In 46 rural circles the recorded death-rate was less than 20 per 1,000. In 15 it was above 40; in 52 between 30 and 40; and in 109 between 20 and 30. The death-rate in towns ranged from 64 at Viramgam to 10·23 at Kalyan.

In Madras both the birth-rate (32·4) and the death-rate (26·2) were higher than in any previous year excepting 1877 in the case of the latter. In the case of the birth-rate the Sanitary Commissioner thinks that the increase is not altogether the result of improved registration, but may be taken as evidence that the depressing effects of the distress of 1889 are passing off. On the other hand, it would seem that the increase in the death-rate may be accounted for, in part at least, by the undoubted unhealthiness of the year, cholera and smallpox having both been unusually prevalent. The district birth-rates ranged from a maximum of 44·7 to a minimum of 22·7. Of the 22 districts, four returned a birth-rate of 40 per 1,000 or over, while in seven the rate recorded was below 30. Turning to the results recorded in the rural registration circles of the different *taluks*, it appears that four recorded birth-rates of over 50 per 1,000; 27 rates from 40 to 50; 82 between 30 and 40; 60 between 20 and 30; while in eight they were below 20. In 12 towns the birth-rate was over 40 per 1,000; in 31 it was between 30 and 40; and in 12 below 30 per 1,000. In 17 towns the birth-rate was lower than the death-rate. The births exceeded the deaths in all districts except Madras and South Arcot. In the former of these the deaths are believed to have been extraordinary on account of the prevalence of cholera, fevers, and bowel complaints; in the latter the excess is small. The highest death-rate (59·4) in districts occurred as usual in Madras. In the remaining districts the rate ranged from 13·5 to 35·3. The death-rate in the municipal towns as a whole was 31·8, and ranged from 64·3 to 17·3; that of the districts, exclusive of the municipal towns, 25·9 and ranging from 59·4 to 13·3. Of the *taluks*, three recorded a death-rate above 40; 44 between 30 and 40; 89 between 20 and 30; while in 45 the death-rate was below 20. The death-rate of children under one year of age per 1,000 of recorded births was 167·4. The ratios have all been calculated on the population of the census of 1881.

The statistics returned from the small province of Coorg are very imperfect. The recorded birth-rate for the year was 20·31 per 1,000, compared with 15·25 in the previous year; and the death-rate 21·79 per 1,000 against 25·32. The proportion of males born to every 100 females was 103·23; that of male to female deaths 121·82. The death-rate in Merkara, the only town, was 20, that of the province, excluding the town, nearly 22. The population of the province according to the census of 1891 was 173,055, compared with 178,302 in the census of 1881. The decline in population is due to the withdrawal of the military garrison from Merkara and to lessened immigration of coolies to the coffee estates. The proper inhabitants of Coorg have increased.

The population of Lower Burma under registration has increased from 3,653,629 in the last decade to 4,595,569 according to the census of 1891. The registration of vital statistics is still very imperfect even in the towns where it is carried on by a paid agency and is supposed to be compulsory. The total births registered amounted to 95,332 against 84,769 in the previous year, which gives a birth-rate of 20·74 per thousand of the population according to the new census. The districts yielded birth-rates ranging from 30·53 in the Tharrawaddy district to 12·88 in the district of Thongwa. In the province, as a whole, 106 male births were returned for every 100 females. The total deaths registered equalled 73,190 against 63,591 in 1890. There were 123 deaths in males to every 100 in females. The death-rate for the province was 15·93. The death-rates are still very low in the Tenasserim division and in nearly all the districts of the Irrawaddy division. The birth-rate in towns ranged from 47 at Myanaung to 12 at Maubin, the rate for the towns collectively being 21·68. The death-rate for the same towns was 29·60 and ranged from 40·26 at Myanaung to

11·95 at Ngathainggyaung. There is a remarkable disproportion in the sexes in some of the towns, especially in the large seaport towns. Thus at Rangoon there are 124,767 males to 55,557 females; at Akyab 29,208 males to 8,730 females. This may account in some measure for the low birth-rate, but it is not in these towns that the birth-rate is most deficient. As regards class registration, the death-rate is most deficient amongst Christians, only 7·16 per 1,000; and next amongst Mahomedans, 14·28. The death-rate in the rural districts as a whole, excluding the towns, was only 14·09. The Sanitary Commissioner hopes that some improvement may be effected in rural registration by the plan, recently introduced, of employing the vaccination staff in testing the registers. The registration of vital statistics has not yet been introduced into Upper Burma.

In Assam there were 143,548 births registered, against 138,326 in 1890, giving a birth-rate of 28·59, calculated on the population of the 1891 census. The ratios ranged from 34·09 in the Sylhet district to 21·32 in Kamrup, the average birth-rate in the Surma Valley being 32·96, and of the Brahmaputra Valley only 24·19. The provincial death-rate (29·91) exceeds the birth-rate by 1·32, and the district ratios for deaths range from 35·91 in Goalpara to 19·91 in Sibsagar. The records show 108 male births and 112 male deaths to every 100 female births and deaths respectively. The statistics received from the *sadar* towns, where "compulsory" registration is in force, are in most cases manifestly incorrect, but there were only 33 convictions for neglect of registration in the whole of these towns. The Sanitary Commissioner approves of a proposal that the police officers should inquire into the correctness of statistical returns when on tour in their districts.

History of Chief Diseases.

Cholera.

In the year under review cholera was again prevalent amongst the general population throughout almost the whole of India, and the total number of deaths recorded as due to it was 601,603 against 297,443 in 1890 and 428,923 in 1889. This is the highest figure recorded in any year since 1877, when there were 635,977 deaths returned from cholera. Compared with the previous year, every province, except Mysore, suffered more severely in 1891, and in Bengal and Assam the number of deaths from cholera has never been so great in any previous year on record.

Statement showing the Deaths from Cholera in the different Provinces in India from 1877 *to* 1891.

Year.	Bengal.*	Assam.	North-Western Provinces and Oudh.	Punjab.	Central Provinces.	Berar.	Rajputana.	Central India.	Bombay.	Hyderabad.	Madras.	Mysore.	Coorg.	Lower Burma.
1877	155,305	11,377	31,770	29	3,418	842	60	926	57,228	7,414	357,430	2,902	‡	7,276
1878	95,192	6,732	22,221	215	40,985	34,306	2,393	8,047	46,743	6,696	47,167	723	49	6,759
1879	136,363	17,415	35,892	26,135	27,575	223	918	2,734	6,937	6	13,296	14	—	1,828
1880	39,643	2,803	71,546	274	330	1	—	299	684	—	613	25	—	2,638
1881	79,180	5,010	25,865	5,207	9,140	3,404	197	581	16,694	1,721	9,446	25	3	5,239
1882	182,352	21,055	89,372	39	11,932	3,573	1,327	1,562	7,904	150	23,604	893	31	7,177
1883	90,439	14,908	18,160	190	16,235	27,897	797	1,740	37,954	1,947	36,284	124	—	2,185
1884	134,421	22,276	30,143	614	149	87	1,297	1,018	13,804	2,479	75,476	330	—	5,515
1885	173,767	7,753	63,457	1,936	21,868	3,683	1,615	4,624	37,287	1,387	58,109	2,677	—	7,685
1886	118,368	20,188	34,565	12	16,679	976	173	290	167	499	12,417	10	—	4,027
1887	172,578	7,941	200,628	8,804	12,576	14,396	2,612	8,868	25,711	2,831	28,359	832	3	2,649
1888	111,391	9,093	18,704	14,938	921	305	32	191	36,500†	2,057	58,677	1,015	2	15,982
1889	171,103	18,288	48,494	2,838	52,588	10,925	6,923	3,344	32,431	1,128	76,020	1,590	9	6,242
1890	145,885	15,396	80,295	3,401	4,787	847	2,746	3,132	3,259	—	35,288	1,326	5	1,076
1891	229,575	23,882	169,013	10,107	21,312	7,958	2,946	13,474	17,850	3,102	98,773	1,204	7	2,400

* Excluding Calcutta.

† Including four deaths, the monthly distribution of which is not known.

‡ Statistics not available.

The disease was at its minimum in January and February and at its maximum in the four months, April to July, as is shown in the following statement :—

Statement showing the Deaths from Cholera registered in the different Provinces by months, during the year 1891.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1891.	1890.
Bengal - - -	15,694	15,305	26,775	44,769	26,818	18,306	20,049	14,548	6,844	6,466	13,652	20,349	229,575	3·26	2·21
Assam - - -	998	1,045	2,307	5,009	5,656	2,669	1,463	920	914	1,053	1,017	831	23,882	4·76	3·40
North-Western Provinces and Oudh.	718	1,115	2,077	13,273	31,915	34,453	32,018	12,110	10,301	10,213	10,842	9,978	169,013	3·60	1·82
Punjab - - -	—	—	—	14	167	181	1,595	2,263	3,375	2,193	266	53	10,107	0·49	0·18
Central Provinces - -	75	89	546	1,630	3,399	6,147	3,985	1,416	1,391	1,836	728	70	21,312	2·42	0·54
Berar - - -	9	2	36	—	—	34	368	3,139	3,081	1,186	95	8	7,958	2·8	0·3
Lower Burma - -	92	84	140	353	513	252	131	306	88	101	126	214	2,400	0·52	0·29
Madras Presidency -	5,912	2,837	1,971	2,937	2,702	3,462	9,856	16,258	9,672	7,064	12,280	23,822	98,773	3·5	1·2
Bombay Presidency -	256	149	63	214	1,315	2,656	3,698	4,437	3,427	901	412	322	17,850	0·95	0·20
Mysore - - -	68	23	71	63	68	187	142	215	154	95	41	77	1,204	0·25	0·32
Coorg - - -	—	—	—	—	—	—	—	—	—	—	7	—	7	0·04	0·03
Total - -	23,822	20,649	33,986	68,262	72,553	68,347	73,305	55,612	39,247	31,108	39,466	55,724	582,081		

The value of the following statement, which is inserted here as in former reports, is somewhat impaired by the fact that the ratios for Madras and the Central Provinces, as well as the mean mortality of the previous five years in all the provinces, have been calculated on the population of the 1881 census, but in the case of all the other ratios the 1891 census has been used :—

Province.	Mortality in 1891.	Mean Mortality of previous Five Years.	Urban Mortality.	Rural Mortality.	Per cent. of Villages attacked.	Maximum Mortality in Rural Circles.	Maximum Mortality in Towns.	Month of Maximum Prevalence.
Bengal - -	3·26	2·02	4·54	3·20	12·0	11·18	31·62	April.
Assam - -	4·76	2·84	4·22	4·77	29·8	11·91	38·63	May.
North-Western Provinces and Oudh.	3·60	1·73	2·55	3·68	12·7	17·59	35·44	June.
Punjab - -	0·49	0·29	0·90	0·46	2·7	4·74	11·81	September.
Central Provinces -	2·42	1·98	1·96	2·46	7·1	7·63	14·00	June.
Berar - -	2·8	1·9	3·3	2·7	9·4	4·0	14·8	August.
Lower Burma -	0·52	1·48	1·27	0·42	3·1	1·76	10·35	May.
Madras - -	3·5	1·5	4·3	3·4	20·2	5·8	21·9	December.
Bombay - -	0·95	1·19	0·50	1·01	6·3	3·38	5·86	August.

In Bengal there were 229,575 deaths from cholera compared with an average of 137,948 per annum in the decade 1881–90. The death-rate was 3·26 per 1,000 against 2·21 in 1890. The excessive mortality from cholera is attributed by the Sanitary Commissioner to the Ardhodoya Jog bathing festival and the scanty rainfall. The festival is one in which the pilgrims bathe in the waters of the Ganges or its tributaries, and occurs only every 27th or 28th year. In the year under review it took place in the month of February, and the attendance at the different bathing-places was unusually great, owing to the fact that this was supposed to be the last of these festivals to be held at the Ganges. Many of the pilgrims arrived in a very exhausted condition; cholera of a very severe type broke out amongst them, and large numbers died at the places where they congregated on the river, and afterwards on the way to, or at, their homes. In this way the disease is supposed to have been spread all over the province, and communicated to the non-pilgrim population; but that this theory of the general epidemic is not absolutely accepted is shown by the following extract from a very full report on the subject by the Civil Surgeon of the Purnea District, who says :—" At the same time it is evident that this pilgrimage was not the " sole cause of the epidemic. Though the pilgrimage was immediately followed by

" an outburst of cholera, especially in the three south-eastern *thanas*, and the disease " was imported by returning pilgrims into, I believe, almost every part of the district, " yet in most places it did not at this time attain any serious epidemic form. It was " not until the end of March and the beginning of April, some six weeks after the " pilgrimage, that cholera in an epidemic form was prevalent all over the district. " My personal enquiries show that after the pilgrimage the disease was imported into " many places, but after causing a few cases and deaths, died away for a time. This " occurred in the Purnea town, and in the villages around Motiari and Raniganj, and " also on a larger scale in Manihari itself, where cholera, after being prevalent for a " month, almost died out by the end of the first week in March to recur with much " greater severity in April. I am therefore driven to the conclusion that the epidemic " would equally have occurred in the district this year even had no pilgrimage taken " place. The only difference would probably have been that it would have commenced " six weeks later, and would have caused fewer deaths, about 10 per cent. (roughly) " lower than that which actually took place. The fact that the district has suffered " from repeated epidemics of cholera almost every other year for the last thirty years, " is also in favour of this view."

On the other hand, it is not unreasonable to assume that the seeds of the epidemic were sown by the returning pilgrims and ripened into epidemic proportions later on through favouring seasonal influences. April to July is the period when generally the disease assumes its greatest proportions.

The districts that suffered most severely were Purnea, Jalpaiguri, Rangpur, and Nadia. There was comparatively little cholera in the Chota Nagpur division, but no district throughout the province entirely escaped. These was very little cholera at the ordinary fairs and festivals held in the various parts of the province. As regards the rainfall the Sanitary Commissioner says:—" The total rainfall was 15·8 inches less " than in 1890, and considerably more deficient than that in individual districts. " Coincidently with the deficiency of rain there was an increase of cholera in nearly " every district. There was not sufficient water to flush and replenish the tanks and " wells, which in consequence contained the impure rainfall of the previous year, and " the increased demand of the people for the scanty supply tended further to pollute " the little water there was."

In the port of Calcutta there were 12 admissions and 9 deaths from cholera among the European seamen, whose average strength for the year was 1,426. The ratio of deaths per 1,000 from this cause, 7·01, was less than in any previous year except 1885.

There were 8,486 more deaths from cholera recorded in Assam than in the previous year, and the total exceeded that of any previous year since registration commenced. The increase is mainly due to exceptional prevalence of the disease in the Surma Valley, and especially in the Cachar district. The disease is said to have occurred especially amongst pilgrims returning to the province from the Ardhodoya bathing festivals at Calcutta and Murshidabad, but there was a noticeable increase in its prevalence in the very beginning of the year before the festival commenced. Deaths from cholera were returned in both valleys in every month of the year, but the largest numbers from March to May in the Surma Valley, and from March to July in the Brahmaputra Valley.

The total number of immigrants into the province of Assam who passed through the depôts was 49,206 against 35,798 in the previous year. These figures do not include the larger proportion of the immigrants into the Surma Valley who do not use the depôts. The number despatched from Dhubri up into the Assam Valley was 19,552 against 13,257 in 1890, and there were 30 deaths amongst them while *en route* to the gardens, against 4 in the previous year. From Goalundo 11,776 were despatched into the same valley against 7,629 in 1890, and amongst these there were 12 deaths between Goalundo and Dhubri, and 26 more higher up the river. Besides these there were many deaths at Dhubri, and at the ports of debarkation, and altogether the total casualties on the journey through the Assam Valley amounted to 83 from cholera, 31 from other causes, or a total of 114, against 22, 15, and 37, respectively, in the previous year. Among the coolies who used the depôts on the Surma side, there were 75 deaths against 37 in 1890.

In the North-Western Provinces and Oudh 169,013 deaths were recorded from cholera, double the number in the previous year, and more than in any previous year except 1887. The death-rate per 1,000 from this cause was 3·60 against 1·82 in 1890

and 4·54 in 1887. The districts most severely affected were Sultanpur, Partabgurh, and Rae Bareli, with death-rates of 17·59, 13,03, and 10·61 respectively. There was only one death in the Jalaun district, and only a small number in Jhansi, Bijnour, Dehra, and Agra. The heaviest mortality occurred in June and July as in 1887, but the disease was still prevalent at the end of the year. In the towns of Bilgram and Kairana the death-rate from cholera alone was 35·44 and 32·14 respectively. In the year under report the great assemblage of people at Hurdwar, on the occasion of the Kumbh fair, took place on the 12th of April, but excellent precautionary measures were initiated in the beginning of December previous, as described in the North-Western Provinces Sanitary Report. Measures were taken:—

(1.) to prevent overcrowding;
(2.) to see to surface cleanliness;
(3.) to give notice of, and remove, nuisances;
(4.) to report sanitary offenders;
(5.) to remove promptly and carefully, those sick of infectious diseases;
(6.) to see the proper location of baggage and other animals; and
(7.) to inspect periodically each section of the site of the fair.

The usefulness of these precautions is fully established by the fact that while the fair lasted only three deaths from cholera occurred, and there was no epidemic outburst of the disease, although it was prevalent before the commencement of the fair in the Kumaon hills and the eastern district of the province. This "dispersion of "hundreds of thousands of pilgrims to all parts of India free of epidemic disease," is all the more remarkable as the total number of cholera deaths in 1891, not only in North-Western Provinces and Oudh, but in all the other important provinces of the country, was unusually large as compared with many of the previous years, showing that an epidemic influence was abroad.

In the Punjab cholera was more severe than in the previous year, the total deaths recorded being 10,107 against 3,401. The disease began with two isolated outbreaks in April, but afterwards spread very gradually over the whole province, and only five districts, out of 31, entirely escaped. The first outbreak occurred at a small village in the Hissar district, where two persons, who had just returned from the Hurdwar fair, were first of all attacked, and afterwards four others, who had not left the village or its neighbourhood. The highest mortality from this cause occurred in the Peshawar and Kohat districts, and there were also serious outbreaks in the Ludhiana and Lahore districts. The largest number of deaths was returned in September. The death-rate from cholera is much greater in villages affected by it than in towns, the death-rate in the former being 6·73 against 1·82 in the latter. The Sanitary Commissioner thinks that this may possibly be due to the greater liability to pollution in the case of the village wells, which are, as a rule, less perfectly protected than the wells in town. Of 37,579 towns and villages in the province, only 1,039 returned deaths from cholera.

In the Central Provinces there were 16,525 more deaths from cholera than in 1890. The disease prevailed in all the districts, but with very unequal severity, there being only a few cases in the Sambalpur and Burhanpur districts, while in others, Damoh, Jubbulpore, and Hoshangabad, the death-rate was higher than in any previous year since 1876. In the districts of Murwara, Narsinghpur, Mandla, and Seoni, the incidence was severe and the death-rate from it higher than the average for the whole province. From the memoranda given by the Sanitary Commissioner for the different districts, collected from the reports of the Civil Surgeons, the following account of the behaviour of the disease in the Jubbulpore district would seem to be applicable to the whole province:—"The disease was not influenced by wind direction or humidity. "It appeared and disappeared capriciously. The insanitary conditions of localities "and their defective water-supply were not in themselves sufficient to cause its "incidence; and villages with bad, or even worse, local conditions were in many "instances left untouched. But when once the disease appeared, its persistence or "severity, or both, seemed to depend on one or other of these factors. Villages "depending on tanks or rivers, in which water is subject to pollution, suffered "more than those drawing from wells. Instances were not infrequent where, "coincident with improved sanitary arrangements, especially the protection of "the water-source from contamination, a marked decrease in the disease was "noticed."

In many districts the first persons attacked are said to have been pilgrims or other persons returning from fairs or other large assemblages of people, and the inference is

drawn that these persons introduced the disease, but in many places no suspicion of introduction by human intercourse could be entertained. In some places, such as the town of Burhanpur, cholera was notably absent, although prevalent in all the villages round about it. The town of Nagpur was affected rather severely, deaths from cholera being reported from all but two of the 24 circles into which it is divided, and also from the central jail which is situated near the town.

In Berar there were were 7,958 deaths registered from cholera, compared with 847 in the previous year. The death-rate from this disease was 2·8 per 1,000. The mortality was not so great as in 1887 and 1889. It was prevalent in every month, except April and May, and attained its maximum in August and September. All districts suffered, but especially Buldana and Basim. The disease was reported in 97 out of 121 circles of registration, and in 532 out of 5,655 villages.

In the Bombay Presidency cholera was more severe than in the previous year, there being 14,591 more recorded deaths, but it was rather less widely distributed. In Sind only one Collectorate, Shikarpur, was affected, and then only slightly; and in Bombay proper the Collectorates of Surat and Kaira entirely escaped; there was only one death in Broach; and only a few deaths in Ahmedabad, the Panch Mahals and Kanara. The death-rate from cholera for the Presidency, calculated on the 1891 census figures, was 0·95, but in the Collectorate of Bijapur the rate was 6·35 and in Sholapur 3·25. The mortality was also high in the Ahmednagar, Poona, Khandesh, and Nasik Collectorates. The disease was present throughout the year, but was at a minimum in March, and reached its maximum in August. Out of 222 rural circles, 116 were more or less affected; and out of 63 town circles, 29. Of the 25,206 villages in the Presidency, 1,600, or 6·3 per cent., were affected. In the Bijapur Collectorate, 39 per cent. of the villages suffered; in Sholapur, 30 per cent. In the city of Bombay there were 146 deaths from cholera against 100 in 1890. On the 11th of September cholera broke out simultaneously in two men-of-war lying in the harbour, and there were in all 38 cases and 19 deaths amongst the crews before the disease ceased. No definite cause for the outbreak could be traced.

In the Madras Presidency cholera prevailed with greater severity than in any year since 1877. The total of the deaths recorded under this head amounted to 98,773, or at the rate of 3·5 per 1,000. The disease was present throughout the whole year, but increased in severity in July and August, and again in November and December. The greatest number of deaths in any one month was recorded in December. The disease was comparatively slight in the districts of Vizagapatam, Ganjam, and South Kanara, and severe in South Arcot, Madura, Bellary, Anantapur, Chingleput, Cuddapah, and Coimbatore. Out of 44,449 villages, cholera was reported from 8,975, or 20·2 per cent. Of the 77 towns, 65 returned deaths from cholera. The death-rate from cholera exceeded 10 per 1,000 in the following towns, viz., Palni, Nellore, Adoni, Anantapur, Chidambaram, Arcot, and Dindigul. It equalled 5·1 in the municipalities as a whole, and 3·4 in the districts, excluding the municipal town. In 34 towns the death-rates exceeded the district ratios; in 14 they were less. The Sanitary Commissioner remarks:—"The reports of the year do not cast any new light upon the "etiology of the disease, but it may be safely assumed that however obscure the "origin and behaviour of the epidemic may be, yet its spread in a place depends "largely on the sanitary conditions present and the very inferior water supply. In "consequence of deficient rainfall in 1891, many of the tanks and wells, which were "drinking-water supplies, became dry, and people had to use any water they could "obtain. Further, owing to the drought, the water in the tanks and wells was much "reduced in quantity, and therefore had a much larger percentage of dissolved and "suspended impurities."

In Lower Burma cholera was more severe than in the previous year, 2,400 deaths being recorded against 1,076, and 188 circles of registration returning deaths from it against 145 in 1890. The disease prevailed throughout the year, but declined somewhat in June and July. The Arakan division, as usual, escaped almost entirely. Deaths from cholera were returned in 547 out of a total of 17,807 villages.

In Rajputana 2,946 deaths were recorded from cholera against 2,746 in 1890. The disease began in Marwar on the 3rd of May, attained its maximum in August, and ceased in November, except in Bikanir, where it continued throughout November and

December and on into the next year. The epidemic was both severe and prolonged, the Ajmere division and 11 States being invaded by it. No cases were reported from the States of Bhurtpore, Kerowli, Tonk, Ulwar, Shahpura, Jeysulmere, and Dungarpur. The largest number of cases and the heaviest mortality occurred in the States of Jhallawar and Marwar, while in the previous year Jhallawar had escaped entirely, and only one case had been reported from Marwar.

Cholera was more or less prevalent in different parts of Biluchistan from the end of July until the close of the year. A few cases had occurred at Sibi in the last days of July, but the first severe outbreak commenced at Mudgorge on the 4th of August. Some 2,000 workmen were encamped on the railway works at this place, amongst whom in the first three days there were about 50 seizures and 25 deaths, and before the end of the outbreak, 200 seizures and 100 deaths, although many of the coolies had fled from the place. Many of the fugitives died on the roads, and at Bostan, in the quarantine camp and neighbouring villages, there were 118 seizures and 95 deaths. At Dirghi, where there was a gang of 500 coolies, there were 77 seizures and 56 deaths; at Hurnai and Lunari and their neighbourhood, there were 26 seizures and 18 deaths; at Fuller's Camp, 18 and 14 respectively. In some places on the line, where there was a good water supply, such as Sharigh, Kach, and Khost, there was no cholera except among travellers arriving from other places. In August and September severe outbreaks occurred in some villages, and in a nomad encampment, in the Quetta district, but in the town of Quetta there were only 26 cases, and it is remarked that in every one of these the patient was shown to have used water from wells, or open streams, instead of the pure pipe-water laid on to the town. Late in August and in September the disease was severe in some of the villages of the Pishin district, and in October and November in the Thal Chotiali Agency. In the Zhob Valley also many places suffered, and towards the end of the year the disease appeared among the coolies collected in the lower Bolan Pass for the reconstruction of the railway.

The following is the usual summary of the cholera reports received from regiments and jails:—

Among the European troops no particular exposure or fatigue is mentioned in any of the 36 reports received, as having preceded the attack in the first patient. In 22 instances premonitory diarrhœa is said to have been noticed, and in 7 the attack was preceded by over-indulgence in fruit, or tinned fish, or ginger-pop. In the 75 reports from Native regiments, the first case is said to have been suffering from unusual fatigue in 14; in four cases attendance at some form of festivity preceded the attack; and in 21 the patient had only been a few days at most in the station where he was attacked. Out of 51 first cases in jails, 17 were patients in hospitals at the time of the attack, and 12 were new arrivals in the jail.

Among European troops diarrhœa appears to have been noticeably prevalent during five outbreaks of cholera. Among Native troops it was prevalent in 25 instances, and in the case of jails in 10.

In the stations at which cholera occurred there were in all 870 buildings occupied by European troops, and patients were attacked with the disease in 135 of them. In the case of Native troops 246 buildings, out of a total of 17,755, yielded cases of cholera; and in jails 151 out of a total of 775.

As usual, every variety of weather is reported from the different stations as prevalent during the outbreak, but owing to the late monsoon an unusually large number report hot and dry weather.

Among European troops no communication could be traced between the first case and any case of cholera outside the regiment in 26 instances. In the 10 remaining cases the disease is said to have been imported, which means that the first patient attacked had been recently to some place where cholera was known or believed to have been prevalent at the time. In the reports from Native regiments, it is said, in 42 instances that there was no communication between the first case and cholera elsewhere; in 33 the disease is said to have been imported; while in two instances contact with cholera patients is mentioned. In the case of jails no communication could be traced in 34, and the disease was possibly imported in 17.

Attendants attacked.—The following statement shows the number and percentage of attendants on cholera cases who were themselves attacked with the disease:—

Communities.	Number of Cases of Cholera treated.	Medical Officers, Hospital Assistants, and other Attendants on Cholera Cases.		Percentage of Attendants attacked.
		Number.	Number of these attacked.	
European troops - - - -	374	628	4	0·64
Native troops - - - - -	755	1,863	35	1·88
Jails - - - - - - -	344	572	17	2·97
Total - - -	1,473	3,063	56	1·83

Sanitary defects in connexion with cholera epidemics.—In the returns from European troops sanitary defects are noted in five instances. At Cawnpore the drainage of the city and bazaar is said to be very bad, the bazaar overcrowded, and its conservancy arrangements not sufficient to keep the latrines clean and to carry away the filth. At Quetta the first case "occurred in a soldier employed as a clerk, and living in very "bad sanitary surroundings," and the disease afterwards attacked the cooks who were "exposed to insanitary influences in the barrack kitchens."

At Chickalda the accommodation in the mud huts was insufficient, and the men's clothes and bedding were constantly damp. At Pagan the accommodation on board the steamer was insufficient, and at Pakkoku the town was not clean, ordure lying about in all directions, and there were many smells in consequence. Among the Native troops the water supply is frequently complained of, particularly by regiments on the line of march or on the Manipur Expedition, but sometimes in cantonments. Thus at Goalundo, when the 40th Bengal Infantry was marching through, the report says, "the water of river swarmed with excreta, and was drunk by the men"; and similar statements are made by many of the regiments on the routes to Manipur. In the report from the 27th Punjab Infantry at Kohat, we are told that the water supply was contaminated by a sewer bursting into it, and the other reports from Kohat say that the men have access to open water-channels which are much polluted. In a few reports defective drainage is mentioned, and in some cases overcrowding. In the reports from jails sanitary defects are rarely mentioned. At Gauhati the pure water supply had broken down for a day, and in a few others the ordinary water supply is said to be defective, while in others the drainage is imperfect.

Cholera camps.—The effect of moving into cholera camp appears to have been generally satisfactory as regards both the speedy cessation of the epidemic, and the general health of the troops or prisoners. British troops went into camp from 16 cantonments in a total of 96 distinct parties. In 81 of these parties there were no more cases of cholera, and in the remaining 15 a total of 58 cases. Twenty-nine Native regiments went into camp in 52 parties, of which 28 had no further cases of cholera, while in 24 there was a total of 237 cases. Amongst these are included regiments already on the march when the disease broke out, and in some cases, especially on the road to Manipur, the regiment seems to have merely marched from one cholera-affected camp to another, and not, strictly speaking, to have gone into a cholera camp at all. Nineteen jails went into camp in 49 parties, of which 30 remained free from further attacks of cholera, and the remaining 19 had a total of 61 cases.

Cholera in the Manipur Expedition.—There was a severe outbreak of cholera amongst the troops engaged in the Manipur Expedition. The Sanitary Commissioner says, that cholera is always prevalent during April in the neighbourhood of Fenchuganj, and along the route between that place and Silchar, along which one column of the troops had to pass. The 3rd Bengal Infantry left Fenchuganj on the 3rd of April, and was attacked with cholera on the 5th. The boats were overcrowded; the food was not of the best description; and the river water, which was drunk by the men, was polluted with cholera corpses. There were in all 36 cases of cholera, and 21 deaths in this regiment, but on the 24th of April it was allowed to march into Silchar, having been free from cholera for ten days, and no more cases occurred in it. This was the only regiment attacked with cholera below Silchar. On the 15th of April the 1–2nd Goorkhas left Silchar for Manipur, cholera being known to be prevalent on the road in front of them, and on the same day a case of cholera occurred in the regiment, but it was a solitary case and recovered. Between the 21st and the 23rd of April,

inclusive, there were 53 cases and 23 deaths in the regiment, and again subsequently at Manipur, between the 8th and the 28th of May, there were 4 more cases and 2 deaths. The 43rd Goorkha Rifles were attacked on the 27th of April higher up on the road to Manipur, and two days after they had been joined by the 1-2nd Goorkhas, from which the Sanitary Commissioner seems inclined to infer that there was infection carried between the two regiments. Other detachments of the same column were afterwards attacked, and the disease subsequently broke out amongst the troops at Manipur itself, including the column that had come from Burma.

Small-pox.

The total number of deaths from small-pox recorded amongst the general population in India as a whole, was 98,831 against 119,854 in the previous year. There was, nevertheless, an increase in the deaths from this cause in Bengal, Assam, the Madras Presidency, Mysore and Coorg, as may be seen from the following table:—

Statement showing the Deaths from Small-pox registered in the different Provinces, by months, during the year 1891.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1891.	1890.
Bengal - -	1,037	1,538	2,507	1,926	1,967	1,826	1,335	959	557	471	714	1,356	16,193	0·23	·19
Assam - -	167	236	303	393	412	261	160	67	118	55	86	103	2,361	0·47	·31
North - Western Provinces and Oudh.	3,552	2,128	3,273	4,278	5,235	4,389	2,931	1,267	498	224	198	382	26,355	0·56	1·26
Punjab - -	215	203	204	219	403	379	357	234	184	160	266	602	3,426	0·17	·47
Central Provinces	68	71	81	112	98	64	61	67	42	36	30	18	748	0·08	·26
Berar - - -	3	2	3	4	8	2	1	1	—	1	2	7	34	·01	·1
Lower Burma -	136	173	230	231	180	153	76	71	24	31	10	11	1,326	·29	1·01
Madras Presidency	3,648	4,502	4,330	4,027	3,691	2,930	3,025	2,804	2,570	2,771	2,672	4,352	41,322	1·4	1·0
Bombay - -	133	203	220	224	191	134	89	63	40	42	43	109	1,491	0·08	·17
Mysore - -	456	427	368	393	454	518	525	423	355	334	297	549	5,099	1·05	·86
Coorg - - -	24	41	29	39	37	41	40	69	23	14	35	84	476	2·75	·19
Total -	7,439	9,524	11,548	11,846	12,676	10,697	8,600	6,025	4,411	4,139	4,353	7,573	98,831	—	—

In Bengal there were 16,193 deaths from small-pox, or 3,574 in excess of the previous year, and 5,037 in excess of the average of the ten years 1881-90. The death-rate per 1,000, of the population was also higher than that of the previous year, or of the decade, the figures being ·23, ·19, and ·15 respectively. The districts which suffered most severely were Cuttack, Midnapore, Lohardaga, and Puri, in all of which the duty of inspecting the work of the vaccinators has been imperfectly performed. A new system, under which the Vaccination Department has been entirely reorganised, and Civil Surgeons made responsible for the vaccination in their districts, has now been introduced, and is expected to yield better results.

In Assam there were 960 more deaths recorded from small-pox than in 1890, the increase being mainly due to the excessive mortality in the Cachar, Kamrup, and Sylhet districts. In Cachar it is said inoculation greatly increased and vaccination was defective. In Kamrup vaccination has been greatly neglected. There were 32 deaths from small-pox in *sadr* towns against only 1 in the previous year.

In the North-Western Provinces and Oudh there were only 26,355 deaths from small-pox against 55,394 in 1890, and the provincial death-rate was 0·56. High death-rates from this cause were returned from the districts of Gorakhpur (3·71), Azamgarh (2·22) and Ghazipur (1·56). The town of Barhaj shows the high death-rate of 14·97 from smallpox, but in 39 of the towns, with a population of over 10,000, there were no deaths from this disease.

In the Punjab the number of the recorded deaths from small-pox (3,426) is the lowest in any year since registration was commenced. The registered death-rate per 1,000 was 0·17, the average for the previous five years being 0·59. Nevertheless there was a death-rate from this disease of 0·68 in the Bannu district, where vaccination is much opposed, and the disease is supposed to have been introduced by inoculators. The disease also prevailed in the Peshawur district, especially in one sub-division, Mardan, in which it was severely epidemic in December. There was also a relatively high mortality in the Kurnal and Rohtak districts, and towards the end of the year there were epidemics in the towns of Beri and Jhajjar, both places where

vaccination is much opposed. A severe epidemic also occurred in the town of Ludhiana in December.

In the Central Provinces small-pox was less prevalent than in any of the past 18 years, and only 748 deaths were recorded from it against 2,265 in the previous year. It was, however, slightly prevalent in almost all districts.

In Berar there were only 34 deaths from small-pox in 1891 against 324 in the previous year. The disease occurred in five of the six districts. Nine of the deaths were in infants under one year of age, and 19 children between 1 and 12.

In the Bombay Presidency there were only 1,491 deaths from small-pox, which is about half the number in the previous year and less than in any year since 1886. Of the total deaths, 410 occurred in children of less than one year old, and 748 in children over one year, but less than 12. The disease reached its maximum intensity in April. Small-pox was prevalent throughout the year in the city of Bombay, and caused 118 deaths against 151 in 1890.

In Madras the mortality from small-pox was higher than in any of the previous six years. Of the total mortality from this cause, 54·1 per cent. occurred among children of less than 12 years of age. Compared with the previous year, it is said that a very small proportion of infants perished from this cause. The highest death-rates from small-pox were returned from the districts of Kistna, Malabar, South Arcot, and Madura; the lowest from Madras, Vizagpatam, Nellore, and especially South Canara and Ganjam. Deaths were registered from small-pox in 44 of the 55 municipal towns. The town of Calicut heads the list with a death-rate from this cause of 20·4 per 1,000, and the Sanitary Commissioner says that in this town vaccination is carried on in a very unsatisfactory manner.

Small-pox was epidemic in Coorg throughout the year, 476 deaths from this disease being registered compared with 34 in 1890. The small-pox death-rate was 2·75. Deaths were registered in 23 out of 27 circles.

There were 1,326 deaths recorded from small-pox in Lower Burma against 3,693 in 1890. Of the total deaths, 199 occurred in infants under one year, and 802 in children between the ages of 1 and 12. The Pegu and Irrawaddy divisions suffered most severely, as was the case in the previous year, while the Arakan division almost entirely escaped. The highest death-rates from small-pox were returned by the districts of Pegu (·91), Henzada (·73), Hanthawaddy and Thongwa (·54), the mean for the whole province being ·29.

Fevers.

The total number of deaths from fevers recorded amongst the general population in India as a whole, was considerably less than in the previous year, viz., 3,817,683 against 4,105,890. The statement below and the notes which follow, give the particulars for the different provinces. There was an increase in the number of fever deaths returned from Bengal, Assam, Berar, Bombay, and Lower Burma. It is probable that influenza contributed to the mortality under this heading in all the provinces, but no definite particulars are given concerning this disease in any of the sanitary reports.

Statement showing the Deaths from Fevers registered in the different Provinces, by months, during the year 1891.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1891.	1890.
Bengal	99,607	95,436	110,805	92,479	77,360	94,636	77,785	99,031	114,019	117,059	171,864	183,314	1,333,395	18·94	17·54
Assam	5,771	5,219	5,023	5,308	6,661	7,277	7,461	6,767	6,536	6,517	6,823	6,602	75,965	15·13	16·52
North - Western Provinces and Oudh.	94,038	81,781	65,657	67,917	76,687	76,243	79,102	70,086	81,955	106,888	115,973	116,782	1,033,059	22·02	28·21
Punjab	39,262	31,856	26,795	24,070	33,112	38,569	55,110	31,989	33,235	41,744	42,776	43,736	442,254	21·52	36·75
Central Provinces	13,605	12,331	11,940	13,077	15,404	15,950	12,751	14,923	18,339	23,091	21,880	17,259	190,550	21·61	21·76
Berar	3,304	2,526	2,615	3,305	2,962	3,556	3,040	4,537	6,879	7,083	5,027	4,016	49,850	1 75	18·2
Lower Burma	3,184	2,412	2,350	2,407	2,260	2,418	3,196	3,965	3,424	3,288	3,250	3,504	35,658	7·76	8·82
Madras Presidency	22,733	18,685	16,753	17,071	17,679	18,998	20,428	21,317	21,408	21,348	23,298	27,311	247,029	8·6	9·2
Bombay Presidency	29,388	25,833	26,298	30,120	28,559	25,628	29,769	29,304	31,464	31,409	34,187	50,954	368,913	19·60	20·96
Mysore	3,543	3,125	26,24	3,093	3,064	3,236	3,546	3,422	3,131	3,145	3,108	3,270	38,307	7·91	11·21
Coorg	215	193	142	175	245	303.	307	261	210	230	234	188	2,703	15·61	21·52
Total	314,650	279,397	271,002	259,022	264,993	286,814	288,495	285,552	320,600	361,802	428,420	456,936	3,817,683		

In Bengal there was a still further increase in the mortality from fevers; 1,333,395 deaths, representing a death-rate of 18·94 per 1,000 of the population, being recorded under this heading, against 1,155,569 deaths, or 17·54 per 1,000 in the previous year. The excessive mortality from fevers, which last year was attributed to abnormal rainfall, must this year, the Sanitary Commissioner thinks, have been due to deficient rainfall—an apparent paradox which he explains as follows:—

"The explanation is that in the present defective drainage, and consequently water-logged condition of Bengal, there is not sufficient exit in years of heavy rainfall for the excess water which stagnates in the soil, and it is well known that stagnant moisture is a cause of malarial fevers. On the other hand, in years of deficient rainfall, such as the year under report, in consequence of the failure of rivers to inundate areas in the interior of the country, the drinking-water sources of the larger proportion of the population are not replenished, and tank and other vegetation begins early to decompose and fill the air with poisonous effluvia. Surface impurities, moreover, in years of deficient rainfall are not washed away, and in their process of decomposition add to the contamination of the atmosphere. The impoverished condition of the people also, owing to the failure of crops and high prices of food, in other words, a lowered standard of living, had much to do with the febrile unhealthiness of the year under report. Many hundred of persons are reported to have suffered a great deal of fatigue, privation, and exposure endeavouring to irrigate their lands from tanks, *khals*, and any pool of water they could find, in consequence of the deficiency of rain, which was less during the year under report than in the previous year in 37 out of the 45 districts. It is therefore not to be wondered at that their exhausted and impoverished systems succumbed to attacks of fever and chill, especially during the months of November and December, in which the highest mortality occurred. Until drainage, a better water-supply, and proper conservancy arrangements are initiated, and the masses taught to appreciate and take an interest in them, it is hopeless to expect an appreciable reduction of the fever mortality of these low-lying provinces."

From the reports of the Civil Surgeons of the districts it would appear that some portion of the mortality recorded under "fevers" was due to an epidemic of influenza, but no details are given. The mortality amongst children seems to have been unusually great, and to have attracted general attention in some districts.

There has again been an increase in the deaths from diseases classed as "Fevers" in Assam, the slight fall in the death-rate being due merely to the use of the figures of the new census. The increase was, however, mainly confined to the districts of the Surma Valley, especially Sylhet. The rainfall in this district was less by 66 inches than in the previous year, and the Civil Surgeon thinks that the increase of fevers may be the result of a partially submerged country being more unhealthy than one that is completely so. There was also an increase of mortality from fevers, and a diminished rainfall in the Nowgong district on the Brahmaputra side.

Of the total deaths from fevers (75,965) in this province, 9,937 were the result of the disease known as *kala-azar*. The Sanitary Commissioner, in a long and interesting note on this disease, expresses the opinion that Surgeon-Captain Giles has arrived at a correct view of the nature of this disease, viz., that it is a form of anchylostomiasis, but he thinks—and this opinion is shared by many of the civil surgeons who have had much experience in the province—that the malarious element which makes the difference between *kala-azar* and anchylostomiasis has been too much overlooked. He believes that *kala-azar* has been hitherto, and will be in the future, confined to the malarial tracts of the *terai*, its place being taken in the upper districts of the province by beri-beri, which is also the result of anchylostomiasis, but is free from the malarial element (shown by enlarged spleen and liver, pigmentation, &c.), which distinguishes *kala-azar*.

There were 211,267 fewer deaths from fevers in the North-Western Provinces and Oudh than in 1890, but, as in that year, they represented 70 per cent. of the total deaths in the province. The diminished number is attributed to the absence or diminished prevalence of influenza, and the comparative healthiness of the people in the autumn months. The provincial death-rate from fevers was 22·02, but high ratios were returned from the *terai* (38·82), Fatehpur (31·45), Farukhabad (31·39), Saharanpur (31·15), and Muzaffarnagar (30·44). The percentage of total deaths returned under this heading ranged from 95 in the Meerut district to 28 in Partabgarh. In the small towns of Sahtawar and Sardhana the death-rates from fevers were 54·43 and 51·08, respectively, and many of the large towns returned high ratios, as, for instance, Cawnpur (39·26), Farukhabad (34·0), Jaunpur (33·82), Fyzabad (31·85), Lucknow

(30·33). At the town of Hapur 98 per cent. of the total deaths were attributed to fevers.

In the Punjab the fever death-rate was very much lower than in the previous year, when it was exceptionally high, but approximated very closely to the average of the previous five years. The highest mortality from fever did not occur, as has always hitherto been the case, in the month of September, October, or November, but in July. The Sanitary Commissioner explains this by supposing that, owing to the low rainfall, malarial fevers were comparatively in abeyance, but that their place was taken by other forms of fever, especially typhus and relapsing fever, which were unusually prevalent. There were two widespread and severe epidemics of influenza, one of which culminated in July, and another in December. Fever of a continued type, in some places returned as typhus, in others as relapsing fever, prevailed also in the frontier districts, especially where the villagers live in ill-ventilated and overcrowded dwellings.

The number of deaths from fevers recorded in the Central Provinces was slightly less than in 1890, and there were fewer cases of fever treated in all the dispensaries. A smaller death-rate under this heading was returned in 10 of the 20 districts.

In Berar there were 49,850 deaths recorded from fevers compared with 47,894 in 1890. The death-rate was 17·5, and ranged in the districts from 21·3 in Wun to 11·9 in Basim. Influenza, which prevailed in 1890, was absent in the year under report.

The total deaths from fevers in the Bombay Presidency amounted to 368,913 compared with 344,897 in 1890, and 296,021, the mean of the previous 10 years. The provincial death-rate for the year under this heading was 19·6, and the maximum rate in any collectorate was 37·3 in Broach. Very high death-rates from fevers were also returned from the following collectorates, viz., Ahmedabad, 31·44; Khandesh, 27·21; Nasik, 25·95; Surat, 25·35; Kaira, 24·17; Ahmednagar, 21·75. The maximum monthly total of deaths from fever occurred in December, the minimum in June. A certain proportion of the mortality recorded under this head may be attributed to influenza.

In Madras the mortality from fevers was higher than in any of the preceding 10 years, with the exception of 1890. In all but six districts the rate was lower than in the previous year. The mortality was, as usual, highest in the Kurnool district, and was high in the districts of Madras, Nilgiris, Cuddapah, and Vizagapatam, Ganjam, and Godavari. The mortality was lowest in Tanjore, and comparatively low in Tinnevelly and Trichinopoly. The death-rate in the rural circles of the Presidency was 8·8, or 2·4 greater than the municipal rate (6·4). The Sanitary Commissioner thinks that it is possible that the lower rate of fever mortality in towns is partly due to the indiscriminate classification of all diseases with inflammatory systems as fever in the more rural or less educated tracts of the country.

The incidence of fevers was comparatively light in the province of Coorg, the death-rate from this cause as recorded being 15·61 per 1,000 of population against 21·52 in the previous year. This is probably to be accounted for by the absence of influenza.

In Lower Burma there were 35,658 deaths registered from fevers, which exceeds the number in the previous year by 3,426, and is more than in any of the preceding 19 years, except 1888. The death-rate for the province under this heading was 7·76 per 1,000, and was high in the Akyab (11·84), Prome (11·72), and Sandoway (10·79) districts. In towns the death-rate from fevers ranged from 29·85 at Pantanaw to 1·61 at Shwedaung. The heaviest mortality occurred in August and the four following months.

The Agency Surgeon, Biluchistan, in his annual report for the year 1891, says: "On "the whole, malarial fevers were less prevalent than in the previous year, and there is "nothing of interest to record regarding them. A continued or remittent form "of fever lasting for from 20 to 25 days, accompanied by constipation, and occasionally "also accompanied by a general papular rash disappearing on pressure, was frequently "observed among patients admitted to the Civil Hospital, Quetta, during the summer. "This fever was fatal in many cases (about 25), and seemed to be contagious. "Another very severe and fatal form of fever was also observed in certain cases, "characterised by relapses after from seven to 30 days. This fever was accompanied "by much nervous excitement and persistently high temperatures. I have known "varieties of contagious fevers in Biluchistan for the last 12 years. In one variety "pneumonia was the prominent feature. These fevers seem to cling for years to old

"buildings, and are associated with hospitals and old barracks and huts, and appear "among troops, and workmen, and villagers from time to time, even when food is "good and plentiful." From this it would appear that typhus and relapsing fevers, or diseases very much resembling them, are endemic in Biluchistan.

Dysentery and diarrhœa.

The deaths recorded from "dysentery and diarrhœa" amongst the general population in India as a whole, amounted to a total of 243,456 against 229,588 in the previous year. The most noticeable increase has occurred in Madras, Berar, and the Central provinces.

Statement showing the deaths from Dysentery and Diarrhœa registered in the different provinces, by months, during the year 1891.

PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1891.	1890.
Bengal	3,910	3,611	3,989	3,079	2,727	3,332	3,272	3,668	3,641	3,411	4,011	4,532	43,183	0·61	·65
Assam	919	814	883	1,040	1,691	1,501	1,225	1,091	1,262	1,315	1,494	1,183	14,418	2·87	2·87
North-Western Provinces and Oudh.	3,394	2,973	2,546	3,238	4,140	4,226	4,518	4,615	4,931	5,392	5,042	4,571	49,586	1·06	1·22
Punjab	778	576	488	527	1,147	1,114	979	960	1,377	1,662	1,443	1,101	12,152	0·59	0·91
Central Provinces	1,032	944	1,264	1,611	1,654	1,755	1,862	2,195	2,555	2,665	1,913	1,439	20,889	2·37	2·01
Berar	833	540	645	831	1,014	940	1,405	3,670	5,154	3,883	1,893	1,199	22,007	7·7	5·1
Lower Burma	204	165	196	257	344	504	654	653	414	336	216	219	4,162	·91	·84
Madras Presidency	2,314	1,926	1,910	1,972	1,745	2,085	2,756	3,705	3,312	2,845	4,176	5,477	34,223	1·2	0·9
Bombay „	2,526	2,181	2,202	2,491	2,957	3,042	3,651	4,776	4,875	3,653	2,699	2,675	37,728	2·00	2·19
Mysore	441	363	319	395	414	393	495	491	460	416	372	377	4,936	1·02	1·09
Coorg	13	12	7	12	25	18	21	12	10	13	13	15	172	0·99	1·30
Total	16,364	14,105	14,449	15,454	17,858	18,910	20,838	25,836	27,991	25,591	23,272	22,788	243,456		

The mortality from dysentery and diarrhœa in Bengal was almost exactly the same as in the previous year, and considerably below the average of the previous five years.

In Assam there were more deaths from dysentery and diarrhœa than in the previous year, and the increase is especially noticeable in the districts of the Surma Valley. The Sanitary Commissioner thinks that many deaths from both kala-azar and cholera are returned under this heading.

In the North-Western Provinces and Oudh there were 49,586 deaths recorded from dysentery and diarrhœa against 53,604 in 1890, and the death-rate was 1·06. High death-rates were returned from Garhwal (7·92), Kumaun (5·51), Lalitpur (4·78), and Dehra Dun (4·05), and in the towns of Kalpi (12·9) and Chandpur (10·44).

In the Punjab there were 12,152 deaths from dysentery and diarrhœa against 17,163 in the previous year. The Sanitary Commissioner attributes the lessened mortality under this heading to the small amount of the rainfall during the autumn months and the moderate prevalence of malarial fevers.

The death-rate from dysentery and diarrhœa was somewhat higher in the Central Provinces than that in the previous year. The Sanitary Commissioner thinks that cases of cholera are probably included under this heading in years when this disease is prevalent.

In Berar the deaths registered from dysentery and diarrhœa amounted to 22,007, giving a death-rate of 7·7 per 1,000, compared with 13,328, and a death-rate of 5·1, in the previous year. The death-rate ranged from 13·3 in the Ellichpur district to 2·1 in Wun.

The deaths ascribed to dysentery and diarrhœa in the Bombay Presidency amounted to 37,728 against 36,037 in the previous year, and 41,789, the mean of the previous five years. The provincial death-rate from these causes equalled 2·0 per 1,000, and in the Collectorates the rate was high in Belgaum, 5·69; Dharwar, 4·82; Bijapur, 4·71; Khandesh, 4·22; and Nasik, 4·18. The maximum mortality occurred in September and the minimum in February.

In Madras the death-rate (1·2) was higher than in any of the previous years since 1882. Among the districts, Madras takes the lead with a death-rate from these

diseases of 11·5 per 1,000, and Chingleput stands next with a rate of 4·2. The lowest rates were returned from Cuddapah, Ganjam, Godavari, Nellore, and Vizagapatam. The rate for districts as a whole equalled 1·1, excluding the municipalities, for which the rate was 3·4. The highest rate in municipal towns occurred at Bezvada (11·9).

In Lower Burma 4,162 deaths were registered from dysentery and diarrhœa in 1891 against 3,067 in 1890. This is more than in any year since 1878, except 1888, and gives a death-rate of ·91. High death-rates from these causes were returned from the districts of Sandoway (2·18), Hanthawaddy (2·07), and Toungoo (2·00). The mortality was highest in June, July, and August.

Injuries.

The deaths recorded from injuries increased from 87,264 in 1890 to 88,933 in 1891. The only noticeable increase was in the North-Western and the Central Provinces.

The deaths from injuries increased from 87,264 in 1890 to 88,933 in 1891. There was an increase under each of the headings, suicide, wounds, and accidents, and snake bite, compared with the previous year.

All other causes.

The balance, or deaths from all other causes, increased from 1,086,586 in 1890 to 1,109,512 in 1891.

Vaccination.

The total number of successful operations performed by the Vaccination Departments of all the provinces together was 5,712,508, compared with 5,812,829 in the previous year. There was a falling off in the number of successful operations in four provinces, viz., Bengal, the Punjab, Lower Burma, and Bombay; and the average number of operations of all kinds performed by each vaccinator was less in Bengal, the Punjab, the Central Provinces, and Lower Burma. The ratio of successful operations per 1,000 of the population ranged from 54·31 in Coorg to 14·37 in Upper Burma. In addition to the above, 170,175 successful operations were performed by the dispensary staff, against 161,769 in the previous year.

In Bengal there were 92 more vaccinators employed than in the previous year, but there were 198,079 fewer operations performed, or a falling off by 107 of the average number of operations per man. The decrease in work occurred in every circle except one, and is attributed to various causes, such as the unusual unhealthiness and prevalence of malarious fevers and influenza; the poverty of the villagers, caused by scarcity, and preventing them from paying the vaccinators' fees; the growing opposition of the people to vaccination. The depôt for the preparation of animal lymph in Calcutta has been improved, and an additional one started in Darjeeling. From these two depôts sufficient lymph is obtained for the requirements of the province, and the introduction of lymph each year from England will now be discontinued. Much success has attended the practice of preserving lymph with lanoline, but the use of glycerine in this connexion is pronounced to be a failure, which is the more curious as it is reported to succeed well in Assam. As usual, however, the principal part of the work was carried on by means of human lymph, bovine lymph being only used to start operations in each district. The Vaccination Department of this province has now been reorganised, and under the new scheme the executive supervision of the work of vaccination has been transferred to the district civil surgeons, the former deputy superintendents and three of the six superintendents being abolished.

In Assam there were 205 vaccinators employed, against 194 in the previous year, and they performed 180,211 operations, or an increase of 16,930. In addition to these, the civil surgeons and the staff of the dispensaries performed 16,936 operations against 10,466 in 1890–91. Of the different classes of vaccinators included in the above-mentioned 205, the Local Board vaccinators and the licensed vaccinators show a satisfactory increase in their work, but the operations performed by the Government vaccinators proper fell off by 8,109 cases, which is attributed to the unsatisfactory work done in the Kamrup district; to the opposition of the villagers in certain places where vaccination is not compulsory; to the prevalence of inoculation in parts of the Sylhet district; and to the necessary placing of medical subordinates in temporary charge of certain districts instead of civil surgeons. There was a falling off of 4,217 cases in the Kamrup district, of 1,869 in the Darrang district, and 123 in Sylhet. In all other districts the work increased. Success is claimed by the vaccinators in 94·2 per cent. of all primary vaccinations, but out of 12,432 cases inspected by civil

surgeons only 86·85 per cent. were found to have been successful. There was a great falling off in the quantity of work done in tea gardens, and success was attained in only 82·76 per cent. of the primary cases, which low figure is said to be due in many cases to the use of inferior lymph which had been too long preserved. Compulsory vaccination in the nine municipalities and stations where it is enforced shows an increase from 1,891 cases in 1890–91 to 2,191 in the year under review. There were 323 notices issued and eight prosecutions for neglect of the provisions of the Act in these municipalities. An animal vaccination depôt has been maintained at Shillong and has proved a great success. The total number of tubes distributed amounted to 223,185 as compared with 112,475 in 1890–91. Lymph preserved in glycerine is said to have proved most satisfactory, and "leaves nothing to be desired," success being attained with it in at least 90 per cent. of the cases in which it was used. Experiments were also made with lymph preserved in lanoline, but the results have not yet been published.

In the North-Western Provinces and Oudh 19 additional vaccinators were appointed during the year to the vaccination staff. There was an increase of 70,812 in the total, and of 41,373 in the successful, operations. The average number of persons vaccinated by each vaccinator increased from 1,317 to 1,377, while the cost of each successful operation fell from two annas and six pies to two annas and three pies. There were 7,781 fewer successful primary vaccinations among infants, which falling off is attributed by the Sanitary Commissioner to the small number of births, the proportion of infants vaccinated being actually greater than in the previous year. Animal lymph operations were carried on in nine towns only, and by far the greater part of the work in these provinces appears to be carried on with human lymph.

In the Punjab there was a falling off in the total number of operations, but this was due to a decrease in the re-vaccinations only, brought about by an order forbidding unnecessary and repeated re-vaccinations at short intervals. Primary operations increased to 611,576 against 588,416 in the previous year. Depôts for the preparation, storage, and distribution of animal lymph have been established at Amritsar in the winter and at Murree in the summer.

In the Central Provinces seven more vaccinators were employed, and 3,731 more operations were performed, than in the previous year. The successful operations in children under one year increased by 17,411. Of the 18 districts, nine show an increase in primary operations and nine a decrease. The work was much hindered by cholera in some districts. Success was claimed in 96·4 per cent. of the primary operations, and 90·29 per cent. of the cases inspected by civil surgeons were found to have been successful. In addition to the above, the dispensary staff performed 1,837 more operations than in 1890–91. Arm-to-arm vaccination was generally employed, but experiments were made with animal vaccination which are to be repeated on a more extended scale in the present year.

In Berar the total number of vaccinations was greater by 14,694 than in the previous year. The increase is mainly in re-vaccinations to which great attention was paid during the year. The number of operations performed by the special vaccinators increased by nearly 23,000, and the average number per vaccinator from 2,471 to 3,013. This is due in great measure to the dispensary towns having been made over to the special staff, but even excluding these towns the work of the vaccinators as a whole shows an increase. The work done by the dispensary staff has for the same reason very much diminished. The percentage of success claimed by the vaccinators in primary cases was 95·1, and ranged from 98·2 in the Amraoti district to 91·3 in Akola. Native superintendents verified the result in 52·8 per cent. of the cases, and the result recorded by them was 93·3 per cent. successes. In the cases inspected by the Sanitary Commissioner, the percentage of success was 92·6. In re-vaccinations the percentage of success claimed was 29·3, the figure ranging from 39·5 in Wun to 21·6 in Akola. In persons with good marks of previous vaccination a perfect result was obtained from re-vaccination in 34 per cent. of the cases, and a modified vesicle in 16 per cent. In persons with indifferent marks a perfect result was obtained in 21 per cent., and a modified result in 27 per cent. In just about half the cases of both categories the operation produced no result. Animal lymph was used exclusively in this province, lanoline vaccine paste being manufactured at the head-quarter station, Amraoti, in the first instance, and a supply sent out to vaccinators, with which they started work, and kept up the supply by vaccinating from calf to calf. There was little difficulty in obtaining calves or young buffaloes.

There was a considerable falling off in the work performed by the Vaccination Department in Lower Burma, the operations having been less by 10,812 than in the previous year. The decrease was most noticeable in the Irrawaddy and Pegu divisions, while in the Tenasserim division there was a considerable increase. The absence of small-pox is the principal reason to which this decrease is attributed. It is satisfactory to read that the attitude of the people in Prome is very favourable to vaccination, particularly in the town, where the total absence of small-pox has followed upon the introduction of compulsory vaccination. At Thayetmyo, famine, and the consequent emigration, has caused difficulties in the way of vaccination, and inferior results at Mergui and Shwegyin are attributed to the prejudices of the people. On the other hand, at Moulmein, voluntary applications were received for the vaccination for 442 children. The average number of persons vaccinated by each vaccinator was 1,962 against 2,159 in the previous year, while the cost per successful case increased from Ro. 4-9 to Ro. 5-3. The percentage of success in primary vaccination was 85·2, which does not differ much from the percentages in the previous three years. In the different districts it ranged from 93·18 in Amherst to 64·71 in Salween. There has also been a decrease in the work done by the dispensary staff, which is partly due to municipal vaccinators working up the dispensaries.

In Upper Burma the vaccinators have been increased from 28 to 32, and the average number of vaccinations performed by each vaccinator was 1,812 against 1,356 in the previous year, so that the total number of operations performed by the Vaccination Department staff was 57,985 against 37,956. The percentage of success in primary operations was 85·74 against 83·34 in 1890–91. There is a wide-spread prejudice against the operation throughout the whole province.

In both Upper and Lower Burma calf vaccination has been used with considerable success, especially as a means of increasing or maintaining the supply of pure lymph for arm-to-arm vaccination. Attempts have been made to preserve lymph with glycerine and lanoline in several districts, but with very variable success even in the hands of the same medical officer at different times.

In the Bombay Presidency, compared with the previous year, there was an increase of 54,218 primary vaccinations performed by the vaccination staff and a decrease of 858 in the primary operations of the dispensary staff. In re-vaccinations there was an increase of, respectively, 14,858 and 126 operations in the hands of the two classes of operators. The net result was an increase of 40,218 operations in both classes. In primary cases the rate of success is said to have been 94·95, and it ranged from 97·7 in the Gujarat registration district to 92·9 in the Sind registration district and 74·41 at Aden. In re-vaccinations success was claimed in 62·14 per cent. of cases, and ranged from 81·13 in Aden to 44·26 in the Western registration district. The Sanitary Commissioner estimates that 76·58 per cent. of the "children available for vaccination" have been protected, but in making the calculation he has taken the recorded births, which are probably very much below the actual number, and has also excluded from the available children the recorded deaths, though it is evident that many of the children who died may have been previously vaccinated; moreover, the population dealt with by the Vaccination Department is more by 6,890,452 persons than that from which the vital statistics selected for comparison are collected. Animal lymph was used in many places with varying success. In certain villages in the Poona district, the people provided either a calf or the money necessary to provide one, and much appreciated animal lymph, as it does away with the necessity of taking lymph from the children's arms; on the other hand, in Gadag-Bettigeri, animal vaccination had to be abandoned owing to the difficulty in procuring calves. In the city of Bombay animal vaccination was practised exclusively; at Karachi it was also carried on, but under great difficulties as regards calves. So long as fresh animal or human lymph is available, the Sanitary Commissioner deprecates the use of mixtures of lymph with lanoline or any other preservative. The mixture, he says, must be inferior and less active than pure fresh lymph, and in the case of lanoline there is a danger of its being mistaken for other animal fats and so exciting popular prejudices. He does not, however, allude to a possible advantage of such mixtures, viz., that they can be sent from a central depôt to places where, from difficulties about calves, or other reason, animal lymph is otherwise unavailable.

In the Madras Presidency nine more vaccinators, including temporary operators, were employed than in the previous year. There was an increase of 92,860 in the total operations performed by all classes of vaccinators. The average number of successful

cases per vaccinator, excluding medical subordinates in dispensaries, was 1,220 against 1,120 in 1890–91. There was a slight falling off in the percentage of success which is attributed to changes in the kind of lymph used. Animal lymph of some kind was used in 64 per cent. of the cases. The best results were obtained with lymph fresh from the calf; lymph preserved with glycerine was less successful, and that preserved with lanoline still less so. In September orders were issued for the entire discontinuance of the use of humanised lymph, fresh animal lymph being employed whenever practicable, and lanoline paste only when the use of stored lymph cannot be avoided.

In Coorg, excluding 839 operations performed in dispensaries, 10,430 persons were vaccinated by all classes of vaccinators, against 7,652 in the previous year, namely, 8,883 by the Government vaccinators, 642 by municipal vaccinators, and 905 by special vaccinators employed in the district on account of the small-pox epidemic. The average number of operations performed by each Government vaccinator, including the special men, was 1,398, and by the municipal vaccinators only 321, compared with 877 and 315, respectively, in the previous year. The average cost of each successful case, including the special, but excluding the municipal work, was 0-3-11 against 0-4-0 in 1890.

Sanitary Works—Military.

The total expenditure in 1891–92 on military works, executed for the health and comfort of troops in India, amounted to Rs. 98,32,152 or Rs. 7,29,164 more than in the preceding year. But the details of the different kinds of work are not yet available.

Civil Sanitary Works.

The total income of the 145 municipalities of Bengal amounted to Rs. 31,20,971, and out of this they spent a total of 9,07,220 or 29 per cent. on the three heads of expenditure—Conservancy, Drainage, and Water Supply. There is a falling off of Rs. 31,352 under the heading "Water Supply," but a satisfactory increase under the other headings. Considerable progress has been made in extending the practice of trenching the night soil and using it as manure, and in some cases it is a source of pecuniary gain to the municipality. Prejudices in this matter seem to be gradually giving way. In addition to the above, District and Local Boards spent Rs. 32,934 on wells and tanks, and Rs. 16,283 on drainage channels, and a further sum of Rs. 1,51,046 was spent by private individuals on tanks and other sanitary works. The Sanitary Board of the province seems to have done a great deal of useful work in the matter of schemes for water supply and drainage, which were planned and considered, and brought to the notice of the municipalities by the Sanitary Commissioner and Sanitary Engineer. The following were the more important matters under the consideration of the Board during the year :—

(1) A water supply for the town of Howrah.
(2) A drainage scheme for Julpigoree.
(3) A scheme for the drainage of Puri.
(4) A comprehensive project for the drainage of the riparian towns on the left bank of the Hooghly.
(5) Improvement of the Burdwan waterworks.
(6) Surveys of the towns of Jamalpur and Pabna with a view to proper drainage schemes.

In the North-Western Provinces and Oudh the following are instanced by the Sanitary Commissioner as the most important sanitary features of the year, viz. :—

(1) The completion of the Allahabad waterworks.
(2) The elaboration of schemes for water supply and sewerage at Cawnpore.
(3) The furtherance of a water supply scheme for Lucknow.
(4) The progress made in the waterworks at Benares.
(5) The completion of measures to improve the sanitation of the Hill Stations, Naini Tal and Mussoorie.
(6) The improvement of the drainage of large tracts of country which are affected by irrigation channels or water-logged, especially the Barhganga and Kali Doab schemes.
(7) The passing of a Water Works Act.
(8) The introduction of a Bill to make better provision for sanitation in villages.

(9) The introduction of Bills conferring powers upon municipalities in connection with the sanitation of lodging houses and the construction of drainage and sewerage works.

In many other instances the municipalities have spent considerable sums and a fair proportion of their income on sanitary works, and altogether considerable advance appears to have been made in the matter of sanitation throughout the provinces.

The Sanitary Board of the North-Western Provinces and Oudh met three times during the year and considered the following subjects:—

(1) A three years' programme of the more pressing drainage works to be undertaken in the provinces.
(2) Drainage obstructions in the non-canal districts.
(3) Standard plans for latrines, slaughter houses, &c.
(4) The village sanitation Bill.
(5) The conservancy establishment of municipalities.
(6) The promotion of vaccination by voluntary vaccinators.

In the municipalities of the Punjab, Rs. 12,04,769 were spent on sanitary works out of a total income of Rs. 40,17,724. The Peshawar and Abbottabad waterworks were completed, and the Delhi waterworks were approaching completion at the end of the year. Waterworks have been commenced at Dalhousie, and at Lahore and Rawalpindi the water systems have been extended. The Jullundur drainage works have been completed, and those at Ludhiana, Gujranwala, and Kohat are well advanced. Similar works for drainage are in hand at Faridabad, Mozang (suburb of Lahore), and Peshawar. The main sewer at Simla has been extended. Numerous schemes for waterworks or improved drainage are still under consideration at various places. A village sanitation Bill has been framed by the Sanitary Board and is under consideration. The Board has also sent in recommendations with a view to improving the registration of births and deaths, and on various other subjects of minor importance. The income from the sale of manure and town sweepings is steadily increasing.

The percentage of income spent on sanitation (excluding medical relief and vaccination) in the *sadar* towns of the Central Provinces ranged from 38·82 at Bhandara to 10·18 at Sambalpur, and was less than 20 in twelve of the nineteen towns. During the year the Chief Commissioner published an important resolution on the subject of rural sanitation. It is proposed to group the villages into sanitary circles of convenient size, so that their sanitary condition may be conveniently investigated by expert sanitary inspectors, specially appointed for the purpose, as well as by the Civil Surgeons and other district officials. The information so collected, together with particulars of the financial position of the villages, will be submitted by the Civil Surgeons to the Sanitary Board, which will issue orders upon it, directing the works to be undertaken, and allotting to the different circles the funds set apart annually by the Government towards this object. The Sanitary Board has at the same time been enlarged by adding to it the Commissioner of the Division, and the Deputy Commissioner and Civil Surgeon of the district in which the Board happens to be sitting, these local officials afterwards carrying out the orders of the Board in their circles. It is intended that the Board should meet at least once a year in each of the five divisions into which the provinces are divided. The Sanitary Board, in the year under review, met twice at Nagpur and once at Chhindwara, and was engaged principallly with the improvement of the Nagpur water-supply and the elaboration of the details of the above-mentioned scheme for rural sanitation.

In Berar 48·6 per cent. of the total income of the municipalities was spent on sanitation. The expenditure under the heading "Conservancy" ranged from 53·3 per cent. of income at Ellichpur to 11·2 at Camp Amraoti. In one municipality an attempt was made to dispose of night-soil by manufacturing it into poudrette, but as yet there is no demand for the article. There was appreciable expenditure on "drainage" in only three towns, the others pleading want of funds for such works. Considerable sums have been spent on "water-supply" in four municipalities. At Akola the municipality paid Rs. 10,000 towards the "Kapsi" water-supply scheme; and at Amraoti the Kalapani tank was improved by extending the catchment area at a cost of Rs. 8,785. In the districts, excluding municipalities, a total sum of Rs. 1,62,859 was allotted to sanitary works, of which Rs. 1,57,618 were actually spent. Of this sum 24·9 per cent. was devoted to conservancy, 18·7 to drainage, and 23·1 to water-supply. The Buldana water-supply has been completed at a cost, in the present year, of Rs. 49,670, and provides for a population of 4,000 people at the rate of

10 gallons of water per head. A sum of Rs. 14,850 was spent on the Akola water-supply, a scheme which provides for the supply of 28,000 persons at 10 gallons per head. District Sanitary Boards assembled at the head-quarter stations of the districts twice during the year. In some villages the limits have been demarcated, beyond which household sweepings must be removed and people must resort for purposes of nature, while in the case of certain rivers, which are the sources of the water-supply, restrictions have been placed on such operations as bathing and washing. The Sanitary Commissioner is, however, much disappointed with the actual results, and thinks that little heed is paid to such regulations. Some towns have been surveyed in connection with drainage schemes, and a good deal has been effected in the way of deepening existing wells and sinking new ones. A sanitary inspection was also made of all places where large annual fairs are held, and steps taken to improve the water-supply in particular in such places.

The percentage of total income spent on sanitary works (exclusive of roads and bridges) in the principal municipalities, towns, unions, and stations of Assam averaged 39·59, and ranged from 71·63 at Gauhati to 10·56 at Barpeta. It exceeded 20 per cent. in 15 of the 17 towns for which particulars are given, and exceeded 30 in 12. Endeavours are being made to introduce cremators or incinerators for the disposal of night-soil and rubbish into all the towns, as sewage farming has so far been found impracticable except in jails. The use of well water is said to be increasing, and the tanks are being gradually filled up. There is a Sanitary Board for the province, which is intended to direct the progress of village sanitation, but no particulars of its work in this respect are given in the Sanitary Commissioner's report.

The expenditure by the Public Works Department on sanitary works in Lower and Upper Burma was as follows:—

——	Lower.	Upper.
	Rs.	Rs.
Water-supply	4,349	23,915
Drainage	23,338	4,092
Latrines and urinals	1,307	3,841
Markets	55,393	7,891

In the municipalities no work of major importance was undertaken during the year, but considerable sums were spent by many of them in such minor works as extending the surface drains, constructing and repairing wells, erecting latrines, &c. The water-supply of the towns is generally unsatisfactory, and the drainage defective, owing to the low level of the original sites. In Rangoon the Shone and Ault system of sewerage has worked well and been considerably extended. The water-works at Prome are said to have proved satisfactory. A scheme for supplying Moulmein with pure water has had to be abandoned on account of its costliness. At Mandalay projects are still under consideration for water-supply and drainage. The Sanitary Commissioner remarks that "the question of village sanitation is one which demands more attention. There is too great a tendency to regard it as hopeless and therefore to abandon all attempts at improvements."

In the Madras Presidency 37·6 per cent. of the total income of the municipalities was allotted to sanitation for 1891–92, and the actual expenditure in the first nine months of the year amounted to 55·8 per cent. of the allotment. The sources of the water-supply and the systems of drainage remained in much the same defective condition as before, but in some towns schemes for drainage and projects for an improved water-supply were in progress, under the guidance of the Sanitary Engineer. The conservancy arrangements continued in much the same state as in former years, being well looked after in some towns, but in others neglected. Compared with the previous year, there has been an increase in the total expenditure under the heads of sweepers, etc., *toties* for public and private latrines, tank-watchers, carts, dust-bins, public and private latrines. The total number of public latrines increased from 958 to 1,191, and the system of cleaning private latrines by municipal agency made some progress both as regards the number of towns into which this system has been introduced and also the number of houses served.

In the districts which are controlled by the Local Fund Boards, only 7·9 per cent. of the total income was allotted to sanitation in 1891–92, and the actual expenditure

was about 55 per cent. of the allotment during the first nine months of the year. With three exceptions the districts have failed, the Sanitary Commissioner says, to utilise a fair proportion of their allotment. The sanitary works undertaken during the year consisted in sinking and repairing wells, constructing and repairing tanks, latrines, drains, dust-bins, constructing markets, clearing and improving village sites, &c.

In the Bombay Presidency the Ahmedabad water-works were opened during the year, but no other work of major importance seems to have been undertaken. Many of the municipalities appear to spend a very small portion of their income on conservancy, even when they show considerable savings at the end of the year. Something has been spent by all the local district boards under the heading "Water-supply," chiefly building or repairing wells and tanks, though hardly anything under any other head. The total amount spent on sanitation is also in many cases very small in comparison with the income. From the notes of the Sanitary Commissioner's inspections it would appear that sanitation is very much neglected in many of the towns, and no mention is made of any scheme of village sanitation, nor had any Sanitary Board been formed in this Presidency in 1891. A Sanitary Engineer has since been appointed and a Sanitary Board has been established, whose proceedings will be included in the next report.

No sanitary works of much importance appear to have been carried out in Coorg during the year. A sum of Rs. 1,273 was spent by the Public Works Department in constructing, and of Rs. 159 in repairing, wells at various places in the district. A sum of Rs. 4,597 was spent by municipalities in so-called sanitary works, but a large proportion of these consists of repairs to roads, bridges, and buildings, and have little connection with sanitation. From the Civil Surgeon's description of the town of Merkara there would appear to be much need of improvement in the drainage, conservancy, and water supply.

General Remarks.

Cholera at the Haj of 1891.

There was again an outbreak of cholera at the Haj of 1891, but it was not so violent as that of the previous year, and was confined almost entirely to the pilgrims, while the residents of Mecca and Jedda almost entirely escaped. The sanitary state of Moona is said to have been unusually good, and the town of Jedda had been put in fair order, but Mecca was in the usual neglected and filthy state. The disease appeared at Mecca on the 11th of July, five days before the Haj, but no official record of the deaths seems to have been kept until the 17th, though 59 deaths are known to have occurred at Mecca before that date. It continued until the 20th of August, and the total number of deaths officially recorded in Mecca, Jedda, and Moona combined was 3,115.

Cholera also at Aleppo.

From a report received from the Residency Surgeon, Baghdad, it appears that cholera was also prevalent in Aleppo, Antioch, and the surrounding districts in July, the disease making its appearance about the 7th of July and continuing throughout the month.

Quarantine at Camaran.

During the season 32 ships with 22,303 pilgrims arrived at the quarantine station at Camaran. Of the total number of pilgrims 13,371 came from Bombay and Calcutta, but it may be noted that many of these were not natives of India. The quarantine imposed on healthy ships varies from five to ten days, but in the case of arrivals from an Indian port is never less than ten days. None of the ships had any cases of cholera among the passengers and crew on the voyage between India and Camaran, and, with one exception, they were allowed to proceed to Jedda on the conclusion of the ten days' quarantine. In the case of the ship "Sculptor" there had been four deaths on board before she reached Camaran on the 1st of May, but three of these were due to debility in old people and one to small-pox. The usual ten days' quarantine was imposed upon her, and all went well until the 8th of May, when cholera broke out amongst her passengers on shore. Between the 8th and 17th of May there were 17 cases of cholera in this batch of pilgrims, and an Arab attendant of the "Lazeret" also died of the same disease. Eventually, on the 21st of May, the pilgrims re-embarked on the "Sculptor" and returned to Bombay. The usual complaints are made of the insanitary state of the quarantine camps. The water supplied to the pilgrims is said to be brackish and turbid, the food-supplies indifferent, the huts very much overcrowded, and the latrines neither cleaned nor disinfected.

Researches by the Special Assistant.

Surgeon-Lieutenant-Colonel D. D. Cunningham, Special Assistant to the Sanitary Commissioner with the Government of India, has continued his enquiry into the pathology of cholera, and his conclusions may be summarised as follows:—

I. The continued study of the various forms of comma bacilli occurring in association with cholera confirms the view that there is no definite relation between the disease and the presence of a specific bacillus, presenting the characters of Koch's comma-bacillus, within the intestinal canal.

II. The character and the persistence of the differences between the various forms after continuous cultivation under like conditions for periods of years affords satisfactory evidence that they are really distinct species, and not mere "atypical varieties" of one and the same species, as is maintained by Koch's followers.

III. The question whether we elect to consider them species of varieties is of no practical importance as regards the validity of Koch's theory, because, if we accept the extremely generalised conception of specificity which the latter view implies, we cannot refuse to regard Prior and Finkler's and Metschnikoff's commas as belonging to the same group of varieties, and with this the specific relation of the species to cholera falls to the ground just as effectively as it would were the association of the disease with many distinct species recognised. If we narrow our definition of species we find the disease associated with several distinct organisms; if we extend it, we find the comma-bacillus is no longer peculiar to the disease.

IV. There is more and more evidence to show that the prevalence of comma-bacilli in choleraic media is a consequence, and not a cause, of abnormal conditions in the host. A very striking piece of evidence in support of this view came out in connexion with an outbreak of ptomaine-poisoning, which occurred in the ship "Crofton Hall" during the course of the present year, for in one of the cases here, which did not otherwise in any way differ in characters from the rest, the intestinal discharges yielded an "atypical variety" of choleraic commas, differing in details from any previously cultivated, but yet presenting features more closely resembling those of "typical" commas than many others associated with true cases of cholera.

In addition to cholera, Surgeon-Lieutenant-Colonel Cunningham has investigated several other animal and vegetable diseases during the year. Several cases of so-called "Cerebro-spinal fever" occurring in the Alipore Jail were examined, but hitherto without any positive results, neither cultivations of the fluids nor sections of the tissues having revealed the constant presence of any specific organisms. Numerous specimens of blood from cases of malarial disease have also been studied, but with equally inconclusive results. As regards diseases of the lower animals, the most interesting materials were derived from an outbreak of Saprolegnia-disease, which occurred among the fish in the Zoological Garden, Alipur. Various interesting blights affecting economic plants have come under observation, including an apparently new fungal disease of potatoes, a root-blight of lucerne, and a destructive chytridial blight affecting the young shoots of the tea plant.

Full details in regard to most of these points will be published in the forthcoming number of the Scientific Memoirs.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR MADRAS FOR 1891.

(Surgeon Lieutenant-Colonel J. A. Laing.)

General Population.

No change has taken place in the mode of registering births and deaths since last annual report, and, although there has been an improvement on the whole in this work, yet real accuracy cannot at present be expected considering the agency—an uneducated one in most cases—through which these statistics have to be collected. In para. 10 of the memorandum by the Army Sanitary Commission on the Indian Sanitary Reports for 1889, it is suggested that the vaccination staff should examine the registers of births and deaths in their tours to test their accuracy. This plan has been adopted in the Madras Presidency since 1879. All Deputy Inspectors of Vaccination are required to examine the birth and death registers of any village or town they visit, and in their weekly diaries they report on the condition, &c., of the registration of births and deaths as found on personal inspection. Vital statistics.

The record of births and deaths during the year under report does not extend to the whole population as ascertained at the census of 1881, viz., 30,835,771; there are certain tracts of zemindary estates, &c., for which no birth and death returns are received. The total population, for which returns were furnished in 1891, was 28,513,734, being 2,322,037 short of the total population.

The total number of births registered during 1891 amounted to 924,238 against 893,645 in 1890, showing an increase of 30,593 for the year under report. The ratio per 1,000 of population was 32·4, which is the highest birth-rate recorded in any year in the Presidency. The following table shows the number of births registered in each of the past 21 years, and it is satisfactory to find that the steady improvement, which has been observed for several years past, continued in the year under report :—

Years.	Population for which returns were received.	Births.	Birth-ratio per 1,000.	Deaths.	Death-ratio per 1,000.
1871	24,555,046	506,707	20·6	444,371	18·0
1872	30,147,779	543,325	18·02	501,482	16·6
1873	30,287,842	527,363	17·4	506,894	16·4
1874	30,360,221	569,631	18·7	516,848	17·0
1875	30,278,903	625,953	20·6	641,260	21·1
1876	29,157,056	619,748	21·2	680,384	23·3
1877	29,209,542	467,543	16·01	1,556,312	53·2
1878	29,127,205	341,388	11·7	810,921	27·8
1879	28,991,267	467,938	16·1	549,390	18·9
1880	28,778,097	641,769	22·3	454,101	15·7
1881	28,676,375	716,672	24·9	465,682	16·2
1882	28,887,111	743,777	25·7	470,700	16·2
1883	28,503,100	774,754	27·2	541,930	19·0
1884	28,151,952	810,102	28·8	650,335	23·1
1885	28,118,178	807,105	28·7	615,449	21·8
1886	28,043,538	837,077	29·8	553,927	19·7
1887	27,907,840	849,551	30·4	604,775	21·6
1888	27,852,474	833,345	29·9	597,015	21·4
1889	28,050,087	867,523	30·9	661,178	23·5
1890	28,522,313	893,645	31·3	650,394	22·8
1891	28,513,734	924,238	32·4	747,553	26·2

The birth-rates in the several districts ranged from 44·7 in Madras to 22·7 in Godávari. In only four districts (Chingleput, Godávari, Malabar, and Tinnevelly) were the birth-rates lower than the average birth-rates for the previous 10 years. In five districts, viz., Chingleput, Kurnool, Malabar, Tinnevelly, and Trichinopoly, the birth-rates were lower than those in 1890; in one (South Canara) they were the same, while in the remaining 15 they were higher. In the Ganjam district there was a marked increase in the birth-rate in 1891 when compared with that of 1890. This, while evidencing improved registration, indicates also that the depressing effects of the distress in 1889 on the fecundity of the people are happily passing away. The districts

which returned the highest birth-rates were Madras (44·7), Salem (40·5), Kurnool (40·4) and Bellary-Anantapur (40·0), and the lowest (Godávari (22·7), Malabar (23·6), Ganjam (25·8) and Nílgiris (28·3).

In four districts (Madras, Salem, Kurnool, and Bellary-Anantapur) the birth-rate was 40 per 1,000 and above, in 10 it was between 30 and 40, and in the remaining seven it was below 30 per 1,000.

Of the 924,238 births registered in 1891, there were 471,144 males and 453,094 females, or in proportion of 103·9 males to every 100 female births. In 1890 the number of males born to every 100 females was 104·2.

As is generally the case in this Presidency, there were fewer births registered in the first and second quarters of the year than in the third and fourth. The largest number of births registered usually occurs in the months of July or August and the fewest in February, and the results obtained this year are not at variance with the experience of former years.

As in past years the births exceeded the deaths, and for 1891 the excess was at the rate of 6·2 per 1,000 of population. In all districts, with the exception of Madras and South Arcot, there was an excess of births over deaths registered. In Madras the deaths exceeded the births at the rate of 14·7 per 1,000 of population, the increase being due to the prevalence of cholera, fevers and bowel complaints during 1891.

The rural birth-rate for the Presidency was, as usual, higher than the urban, the ratios per 1,000 of population being 32·2 and 31·5 respectively. In eight districts (Coimbatore, Ganjam, Godavári, Madura, Malabar, Nílgiris, South Canara, and Vizagapatam), the urban birth-rates were higher than the rural birth-rates.

On the whole, there has been an improvement in the registration of births in municipalities during 1891 when compared with 1890. In 12 towns in 1891, against nine in 1890, the birth-rate was above 40 per 1,000; in 31 towns in 1891 the birth-rates were between 30 and 40 per 1,000, and in 12 towns in 1891, against 18 in 1890 the birth-rates were below 30 per 1,000. In seventeen towns (Bezváda, Tuticórin, Cochin, Calicut, Adóni, Erode, Kumbakónam, Kurnool, Rajahmundry, Tirupati, Ellore, Tanjore, Chidambaram, Trichinopoly, Nellore, Negapatam, and Cuddapah) in 1891, against sixteen towns in 1890, the birth-rates were lower than the death-rates.

Deaths.

During 1891 there were 747,553 deaths registered in the Madras Presidency, corresponding to an annual death-rate of 26·2 per 1,000 of the population. This rate of mortality is higher than any rate which has been recorded since 1878. The death-rate for 1890 was 22·8 per 1,000, and the average rate for the previous five years was 21·8. The death-rate for the year under review was, therefore, 3·4 per 1,000 greater than that of the previous year, and 4·4 per 1,000 greater than the average of the previous five years.

The following table, which gives the principal causes of death, shows the total mortality of the Presidency during the past 21 years :—

Years.	Total Deaths.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	Other Causes.
1871	444,371	17,656	20,823	192,469	38,928	15,323	159,172
1872	501,482	13,247	39,074	214,148	39,387	15,150	180,476
1873	506,894	840	51,784	222,843	36,392	14,251	180,784
1874	516,848	313	48,343	226,220	37,993	13,065	190,914
1875	641,260	94,546	24,775	252,042	37,484	12,421	219,992
1876	680,384	148,193	23,469	230,092	38,176	11,175	229,279
1877	1,556,312	357,430	88,321	469,241	133,366	16,460	491,494
1878	810,921	47,167	56,360	374,443	48,083	15,007	269,861
1879	549,390	13,296	17,840	285,477	23,218	12,619	196,940
1880	454,101	613	14,529	209,940	19,622	10,845	198,552
1881	465,682	9,446	15,776	203,542	18,961	11,527	206,430
1882	470,700	23,604	20,159	188,561	19,958	11,611	206,807
1883	541,930	36,284	37,975	203,786	22,098	11,509	230,278
1884	650,335	75,476	61,247	215,977	28,775	11,502	257,358
1885	615,449	58,109	34,726	218,786	31,209	11,659	260,960
1886	553,927	12,417	17,129	221,679	27,379	13,103	262,220
1887	604,775	28,359	21,472	240,860	26,679	11,328	276,077
1888	597,015	58,677	21,858	204,561	27,721	11,401	272,797
1889	661,178	76,020	29,138	230,172	29,122	11,506	285,220
1890	650,394	35,288	28,092	262,855	26,608	10,402	287,149
1891	747,553	98,773	41,322	247,029	*34,223	10,542	315,664

* Dysentery and diarrrhœa only.

With the exception of "fevers" the number of deaths registered under each of the principal causes in 1891 was greater than that recorded in 1890.

Of the 747,553 deaths recorded, 382,419 occurred among males and 365,134 among females, the annual death-rates per 1,000 having been 27·1 for males and 25·3 for females. In only one district (Madras) was the female death-rate (60·6) above the registered male death-rate (58·2). The registered male is thus higher than the female death-rate, and this is in accordance with the experience of former years. For every 100 females who died 104·7 deaths among males were registered, but the proportion varied considerably in some districts.

Out of a total death-roll of 747,553, there were 154,688 deaths amongst children under one year of age, and 124,284 among children above one year and under five, the respective death-rates having been 172·0 and 43·1 per 1,000 of population, calculated on the population according to the census of 1881. In England, the death-rate of children under one year of age is calculated on the number of children born during the year, and when this is applied to Madras, it will be found that the death-rate of infants under one year of age in 1891 was 167·4. The infantile death-rate or proportion of deaths of infants in the first year of life to 1,000 registered births in 1891 was 167 in the 28 towns, ranging from 137 in Brighton to 227 in Preston. The deaths in children under five years of age formed 37·3 per cent. of the total deaths. The period when fewest deaths occurred in 1891 was, as is usually the case, in the age of above 10 and under 15, the ratio per 1,000 of population being 7·5.

With regard to the influence of sex on mortality, it appears that from infancy up to 15 years of age females have a better chance of life than males, and also from 30 years upwards. Between the ages of 15 and 20, a period burdened with maternal cares, the death-rate amongst females was greater than that of males.

According to classes, the deaths registered amongst Hindus were in the proportion of 26·3 per 1,000; Muhammadans, 25·7 per 1,000; Native Christians, 22·3 per 1,000; and "other classes," 13·1 per 1,000. In 11 districts (Chingleput, Cuddapah, Godávari, Kurnool, Madura, Nellore, Nílgiris, North Arcot, Salem, Tinnevelly, and Trichinopoly), no deaths were recorded among "other classes."

In normal years the smallest number of deaths is registered in March, April, and May. In 1891, the smallest number of deaths (46,530) took place in March and the largest (97,535) in December. The most unhealthy months were November and December, and the most healthy March, April, and May. A sudden rise in the death-rate usually occurs in December, and this was also the case in 1891.

According to districts, the highest death-rate (59·4) occurred (as has been the case for some years past) in Madras, and was due to the high death-rates from fevers, diarrhœa, and dysentery, and all other causes when compared with the ratios of other districts. The death-rate varied in the several districts, and (excluding Madras) ranged from 13·5 per 1,000 in Ganjam to 35·3 per 1,000 in South Arcot. In all districts, with the exception of South Canara and Ganjam, the death-rate of each district was higher than the average rate of the previous 10 years. The amount of increase, however, varied in the different parts of the Presidency. In the districts of Nellore, Cuddapah, Salem, Trichinopoly, North Arcot, Chingleput, Nílgiris, Coimbatore, and Kurnool, the death-rate was from 5·7 to 8·7 per 1,000 higher than the average of the previous 10 years; and in Anantapur-Bellary, Madura, Kistna, South Arcot, and Madras, the increase was from 9·1 to 19·8 per 1,000. In two districts (Salem and South Canara) the recorded death-rate per 1,000 of population was lower in 1891 than in 1890, but in all the other districts (with the exception of Vizagapatam, where it was the same) the death-rate was higher.

The death-rates among the urban and rural populations were 30·0 and 25·4, respectively, against 22·1 and 22·2 in 1890. In all districts, with the exception of Chingleput and South Arcot, the urban death-rate was higher than the rural. Judging from the death-rates amongst the rural population, the most unhealthy districts were South Arcot, Chingleput, and Kurnool.

The average death-rate of the 55 municipal towns was 31·8 per 1,000 of population or 5·9 higher than the district rate. The highest death-rates occurred in Bezváda (64·3), Palni (49·7), Calicut (47·6), and Tuticorin (47·4), and the lowest in Berhampore (19·3), Chicacole (19·1) and Cocanada (17·3).

Chief Diseases.

Cholera.

Cholera prevailed with great severity during the year under review, and the epidemic was the severest which has visited this Presidency since 1877. The number of recorded deaths amounted in all to 98,773, or at the rate of 3·5 per 1,000 of population.

The following table shows the ratios of cholera deaths for the past 21 years :—

Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.
1871	0·7	1878	1·6	1885	2·06
1872	0·4	1879	0·4	1886	0·4
1873	0·02	1880	0·02	1887	1·01
1874	0·01	1881	0·3	1888	2·1
1875	3·1	1882	0·8	1889	2·7
1876	5·08	1883	1·2	1890	1·2
1877	12·2	1884	2·7	1891	3·5

The greatest mortality from cholera took place during the months of July, August, November, and December. In no month of the year was cholera absent from the Madras Presidency, and the greatest number of deaths (23,822) was registered in December. As regards this Presidency, cholera usually attains its maximum degree of intensity during the cold weather months, and 1891 was no exception to the rule.

In January, deaths from cholera were reported from 14 districts, the number of casualties having amounted to 5,912. In February and March the disease subsided, as the deaths were only 2,837 and 1,971 respectively. In April, there was an increase, and 2,937 deaths were recorded. In May there was a decrease, but in June, July, and August an increase took place, and 3,462, 9,856, and 16,258 deaths respectively were reported. In September the disease somewhat abated, and still further declined in October. In November it increased, and in December it assumed a still greater intensity, and 23,822 deaths were reported.

In every district in the Presidency deaths from cholera were reported during the year, and in eight districts (Chingleput, Coimbatore, Madura, Malabar, Salem, South Arcot, Tanjore, and Trichinopoly), deaths were registered during every month of the year. In three districts the mortality from cholera was slight, thus in Vizagapatam, the death-rate per 1,000 of population was 0·02, in Ganjam 0·09, and in South Canara 0·3. The districts which suffered most from cholera were South Arcot with a death-rate of 8·8 per 1,000 of population, Madura 5·9, Bellary-Anantapur 5·6, Cuddapah 5·5, and Chingleput and Coimbatore 5·0. In all districts, with the exception of Vizagapatam, Ganjam, Godávari, and South Canara, the death-rates were higher than the average of the previous five years. In one district only (Tinnevelly), the death-rate per 1,000 of population was lower than in 1890.

Out of 44,449 villages in the Presidency, 8,975 or 20·2 per cent. were affected by cholera. In 1890, there were 4,197 or 9·4 per cent. of the villages affected.

In 65 out of a total of 77 towns, deaths from cholera were recorded, and in the remaining 12 no deaths were registered.

Of the 98,773 deaths registered in 1891 from cholera, 6,789 occurred in municipal towns. In 7 municipalities (Berhampore, Parlákimedi, Chicacole, Vizianagrum, Anakápalle, Bimlipatam and Mangalore) no deaths from cholera were recorded. Calculated on the populations of the affected towns and districts, the cholera death-rate in municipal towns was 5·1, and that in the district 3·4. The mortality from cholera in affected towns was thus a third greater than it was in the affected districts. The death-rates in 34 towns exceeded those of the districts and in 14 they were less.

The reports of the year do not cast any new light upon the etiology of the disease, but it may be safely assumed that, however obscure the origin and behaviour of the epidemic may be, yet its spread in a place depends largely on the sanitary conditions present and the very inferior water-supply. In consequence of deficient rainfall in 1891, many of the tanks and wells, which were drinking-water supplies, became dry and people had to use any water they could obtain. Further, owing to the drought, the water in the tanks and wells was much reduced in quantity, and, therefore, had a much larger percentage of dissolved and suspended impurities. Such measures as could be taken were resorted to by the district authorities to arrest the progress of the disease and to mitigate the sufferings of the people. Medical subordinates and members of the Vaccination Department were employed in distri-

buting medicines and rendering aid to those ill. Efforts were also made to improve the conservancy arrangements; wells were cleaned out and deepened; and in places people were prohibited from taking water from sources suspected of originating or fostering the disease.

Small-pox.

The total deaths registered in 1891 from small-pox were 41,322, against 28,092 in 1890, and a decennial mean of 28,757. The small-pox death rate for the Presidency during the year under review, was 1·4 per 1,000 of population, for 1890 it was 1·0, and for the five year period 1886–90 the annual average rate was 0·8. The mortality from small-pox for the year under review is higher than that of any of the six previous years, and 0·6 higher than the mean ratio per 1,000 for the previous five years.

The greatest number of deaths from small-pox occurred in February and the fewest in September. It is usually during the months of February, March, and April that small-pox prevails most severely, and the months of August, September, and October are those in which the fewest deaths are registered.

There were 6,786 children under 1 year of age, and 15,593 over 1 and under 12 years of age who died from small-pox in 1891. The largest number of deaths from small-pox occurred, as is usually the case, among infants and children under 12 years of age, no less than 54·1 per cent. of the total mortality from small-pox being borne by them. Compared with the preceding year, it is to be observed that a very small proportion of infants perished from this cause in 1891. The mortality among males was slightly in excess of that of females.

In all districts deaths from small-pox were recorded. Although in 1891 the total deaths (41,322) exceeded those (28,092) for 1890, yet in 11 districts (Bellary-Anantapur, Chingleput, Cuddapah, Ganjam, Kurnool, North Arcot, Salem, South Arcot, Tanjore, Trichinopoly, and Vizagapatam) in 1891, the death-rates per 1,000 of population were lower; in two (Madras and Nellore) they were the same; and in the remaining eight (Coimbatore, Godávari, Kistna, Madura, Malabar, Nílgiris, South Canara, and Tinnevelly) they were higher. In nine districts (Bellary-Anantapur, Cuddapah, Ganjam, Kurnool, Nellore, Salem, South Canara, Trichinopoly, and Vizagapatam) the ratios per 1,000 of population were lower than the mean ratios per 1,000 of population for the previous five years; in the Nílgiris they were the same, while in the remaining 11 districts they were higher. The highest death-rates were obtained in Kistna (5·3), Malabar (2·7), South Arcot (2·6), and Madura (2·4). The lowest recorded death-rate (0·1) was registered in both the South Canara and Ganjam districts. The mortality (0·2) was also low in the Madras, Vizagapatam and Nellore districts.

In 44 of the 55 municipal towns, deaths from small-pox were registered. Calicut heads the list with a ratio of 20·4 per 1,000 of populatiou, the rate for the district being 2·7. In this town vaccination is carried on in a very unsatisfactory manner. The lowest ratio (0·03) per 1,000 of population took place in Vizagapatam.

Fevers.

The registered mortality from "fevers" during the year was 247,029, yielding a ratio of 8·6 per 1,000 of population against 262,855 or 9·2 per 1,000 in 1890, and 232,025, or 8·2 the mean of the previous five years. Compared with 1890 there was thus a decrease of 15,826 for the year under report. In none of the preceeding 10 years, with the exception of 1890, was the fever mortality so high as in the year under review.

In all districts, with the exception of Chingleput, Ganjam, Godávari, Madras, Nellore, and Tanjore, the death-rates from fever were lower than those of the previous year. The highest death-rate (21·1) occurred, as usually happens, in the Kurnool district, and the lowest (2·3) in the Tanjore district. The rate of fever mortality was high in the districts of Madras (17·0), Nílgiris (16·9), Cuddapah (14·9) and Vizagapatam (14·3).

The largest number of deaths (27,311) was recorded in the month of December and the fewest (16,753) in March.

The district presidency rate was 8·8, or 2·4 more than the municipal presidency rate (6·4). In 16 municipal towns, the death-rates were higher than those of the districts, in one they were the same, while in the remaining 38 municipalities they were lower. It is possible that the lower rate of fever mortality in towns as compared with that in rural circles is partly due to the indiscriminate classification of all diseases with inflammatory symptoms as fever in the more rural or less educated tracts of the country.

Dysentery and diarrhœa.

There were 34,223 deaths recorded under "dysentery and diarrhœa" in the Presidency during the year, or 7,615 more than were registered last year from bowel-complaints.

The death-rate for 1891 was 1·2, and was higher than any of the previous recorded death-rates from bowel-complaints since 1882.

The district which recorded the highest mortality from "dysentery and diarrhœa," was Madras with a death-rate of 11·5 per 1,000, and following it comes Chingleput with a ratio of 4·2 per 1,000 of population. The two districts usually return the highest death-ratios from this complaint. The lowest ratios were recorded in the Cuddapah, Ganjam, Godávari, Nellore, and Vizagapatam districts, the death-rate being the same in each, viz., 0·5 per 1,000 of population, Ganjam excepted, where it was only 0·2.

The largest number of deaths was recorded in December and the fewest in May.

The district presidency rate was 1·1 per 1,000 of population, and was 2·3 less than the municipal presidency rate (3·4). In 49 municipal towns, the death-rates were higher than in the districts, in five they were lower, and in one equal.

The highest death-rate in municipal towns from "dysentery and diarrhœa" is reported to have occurred at Bezváda, where it attained the ratio of 11·9 and next to it comes Tuticorin with a death-rate of 8·7. These two municipalities usually returned the highest death ratios from this cause. The lowest death-rate (0·2) was registered at Adóni.

Injuries. The deaths recorded from injuries amounted to 10,542, or 140 more than the deaths registered in 1890, and the death-rate per 1,000 of population was 0·4. There was a decrease in the number of deaths registered from suicide, wounds and accidents in 1891 as compared with 1890, but an increase in the number of deaths from snake-bite and killed by wild beasts. The death-rates varied in the different districts (excluding towns) ranging from 0·1 per 1,000 of population in the Nílgiris to 0·5 in the Cuddapah, Kurnool, North Arcot, and South Canara districts.

The deaths ascribed to wounds and accidents numbered 6,322, and, as frequently happens, the largest number occurred in the North Arcot district. Snakes and wild beasts caused 2,304 deaths in 1891 against 2,042 in 1890, the largest number (214) occurring, as usually happens, in the South Arcot district.

All other causes. The registered mortality from "all other causes" amounted to 315,664 in 1891 against 287,149 in 1890, and 276,693 the mean of the five years 1886–90. The death-rates under this head was 11·1 per 1,000 against 10·1 in 1890.

Sanitary Works.

Municipalities. Excluding the city of Madras, which has an Act (I. of 1884) of its own, the number of municipalities administered under the District Municipalities Act, IV. of 1884, was as in previous years, 55.

Sanitary Works.—The nature and description of the sanitary works executed in the different towns will be found summarized in the appended statement, which also shows the condition of each town in respect of its water-supply, drainage, and conservancy, and the rate of mortality per 1,000 of population. As in previous years, the works undertaken during 1891 were of the following kinds:—

(*a.*) Sinking, repairing, and cleansing wells, &c.

(*b.*) Construction and repair of drains, public latrines, cinerators, dust-bins, markets, slaughter-houses, &c.

(*c.*) Improvement of village sites, &c.

In some towns comprehensive schemes for draining them and projects for giving the people the benefits of an improved and wholesome water-supply were in progress, and in others they were under preparation or investigation. Detailed information regarding these will be found furnished in the report of the Sanitary Engineer. As heretofore, the sources of water-supply and the systems of drainage remained very much in the same defective condition, and until these potent auxiliaries to health are put in a satisfactory condition a marked diminution in the mortality of our towns cannot be hoped for. The conservancy arrangements which obtained in the towns continued very much the same as reported on in previous years. In some towns the conservancy arrangements were well looked after, but in others they were very indifferently attended to.

The total estimated income of the mofussil municipalities for 1891-92 was Rs. 26,52,995 against Rs. 21,17,640 for 1890–91. Of this amount the allotment made for sanitation was Rs. 9,97,380 or 37·6 per cent., and the actual expenditure during the first nine months of that year amounted to Rs. 5,57,140 or 55·8 per cent. of the allotment. The municipal councils of several of the towns did not utilise a fair share of the sanctioned allotments in the period under notice.

The Madras Local Boards Act V. of 1884 was in operation in all the districts of the presidency except Madras, in which the city of Madras Municipal Act I. of 1884 was in force. As in previous years, there were 21 local fund districts corresponding with the collectorates, of which the Collector was the President. Each district board had subordinate to it a number of taluk boards and union panchayats. District Local Fund Boards.

Sanitary Works.—The sanitary works undertaken during the year were much the same in character as those executed in previous years. They consisted in sinking and repairing wells, construction and repair of tanks, latrines, drains, dust-bins, &c., and improvement of village sites, and water-supply generally.

Water Supply, Drainage, and Conservancy.—As usual, tanks, ponds, wells, rivers, springs, canals, &c. formed the sources of water-supply. The drinking water sources appear to have been better watched from pollution, and a great many tanks and wells were cleaned and deepened. The system of drainage underwent no change. It consisted chiefly of side cuttings to carry off rain water. There were in all 862 villages conserved during the year out of a total of 42,862 villages in the several districts. Of these, 272 are unions and 590 other villages. In the previous year 815 villages were conserved, of which 254 were unions and 561 other villages. Thus there was an increase of 47 towns. The largest number of villages conserved was in the Godávari district and the smallest in Nílgiris.

The total estimated receipts of the district for 1891–92 was Rs. 83,04,687 against 81,13,429 in 1890–91. Of this sum, Rs. 6,59,647 were allotted for sanitation, and the actual expenditure amounted to Rs. 3,62,620 or 54·9 per cent.

With the exception of Chingleput, Ganjam, and Nellore, the other districts have failed to utilise a fair share of the year's allotment.

General Remarks and Personal Proceedings.

I held the appointment of Sanitary Commissioner, and Surgeon-Major Dymott carried on the duties of Deputy Sanitary Commissioner throughout the year. All the 55 municipal towns in the Presidency were visited during the year. I inspected 27 municipalities and the Deputy Sanitary Commissioner 28. In addition to these 42 places were visited by the Deputy Sanitary Commissioner and 75 by me. The time I spent on inspection duty was $5\frac{1}{2}$ months and by the Deputy Sanitary Commissioner five months. In the Appendices will be found two tables, one showing the names of municipalities inspected during the year, the dates of inspection, &c., and the other the names of the places visited. In my inspection of towns and villages it was my practice to go round with some of the native gentlemen of the place, and discuss with them various matters of sanitary interest, attention being especially drawn to the most prominent defects of the place under investigation at the time. I also took occasion to examine the birth and death registers, and, in doing so, to point out errors, to apply tests, to ascertain how far the registers were reliable, and urged especially upon municipal chairmen the great importance and value of such records. Although in many places registration of births and deaths is still far from accurate, yet there has been on the whole an improvement in the work during 1891. Whenever the monthly rates registered in a municipality are found to be low, or less than those registered in the neighbouring municipalities, or even of the district in which the municipality is situated, attention is called to the subject and explanation requested.

Although measures for the removal of sanitary defects in municipal towns are being introduced slowly, yet in some improvements have been and are being effected. It is certain that much of the large mortality which undoubtedly occurs year after year is due to causes which it is possible to remove, but it is equally certain that the complete removal of the causes must in any circumstances be a work of time and require a large expenditure of money.

The general and fundamental sanitary defects of municipal towns are (firstly) the unsatisfactory character of the water-supply and (secondly) the absence of an effective system for the disposal of sewage. The provision of a sufficient supply of pure drinking water is a matter of vital importance, not only to the towns themselves, but also to the neighbouring country or area influenced by them. Works for providing a sufficient and wholesome supply of drinking water for some of the towns are now being prepared. An improved system of water-supply will necessitate an improved system of sewerage. When water comes to be used by the people in adequate quantity, effective arrangements will be required for the removal of waste or soiled water, for, if the water be allowed to stagnate and sink into the soil after use, it will at once give rise to all the evils attendant on dampness of the soil and excite putrefaction of the excrements with which the soil of towns is saturated.

A practice which is very common in most of our towns is that of digging holes within or adjoining house sites for earth to repair or rebuild the house walls; and as these pits are afterwards filled with rubbish of sorts containing objectionable matter, the practice is fraught with danger to health and should be strictly forbidden. Owing, however, to its cheapness and convenience, the practice is one which commends itself to the people as both rubbish is disposed of, and the pits are filled up by one and the same action. It is simply adding to instead of lessening the filth of a town, and all excavations or pits which are made should be filled with wholesome material, and all rubbish removed out of the town. Until this is done there will always be pollution of the air as well as of the water in wells in the vicinity of pits filled up with filth.

During the year some progress has been made in improving sanitary arrangements in villages. Many tanks and wells have been deepened and cleaned out, and put in a much more satisfactory condition. So far as villages are concerned, the evils lie mostly on the surface, and what is really wanted in villages is chiefly to ensure the maintenance of a pure water-supply, to keep the wells clean, and to remove the rubbish to some distance from the village site.

The condition of the cow-houses in towns is still far from satisfactory, and large numbers of cows, buffaloes, and goats are kept at night in towns. The custom is a great evil, but it has become so ingrained in native feeling that its abolition must be a work of time. In many cases the cattle are stabled in the public streets at night, and this practice might be forbidden. The private yards where cattle are kept are, as a rule, extremely filthy. A remedy for the evils attendant on the keeping of great herds of cattle in towns would be for municipalities to erect cattle pens outside the towns and charge a remunerative fee for the accommodation of cattle at night.

With regard to sewage farming in this Presidency, there has been no change since last report, and it is carried on in very few places. In most towns there are no proper arrangements made for the termination of the open street drains, and in many cases the sewage either sinks into the ground or finds its way into any depression or nullah. As drainage schemes for towns progress there is no doubt that sewage will be largely utilized for irrigating and manuring purposes.

There were 454 places inspected in 1891 against 292 in 1890. Forty-one places were inspected more than once during the year. Many valuable suggestions were made by the district medical and sanitary officers, and I trust they will lead to the further improvement of sanitation in towns and villages.

ABSTRACTS OF REPORT OF THE SANITARY COMMISSIONER FOR BOMBAY FOR 1891.

(*Dr. C. W. Macrury.*)

General Population.

Vital statistics.

Comparing the numbers (16,454,414) of the former census, 17th February 1881, with those (18,857,044) of last, 26th February 1891, it is seen that an increase of 2,402,630 in the total population for the Presidency has occurred during the last 10 years.

As only the vital statistics of the native civil population of the Presidency are compiled (*vide* Government Resolution, General Department, No. 4674, dated 7th December 1872), the calculations are based on the population exclusive of Europeans and Eurasians, viz., 18,820,346.

In the Presidency of Bombay, including Sind, during the year 1891 there were 682,677 births registered against 641,115 in 1890. The recorded births for the year under report were thus 41,562 in excess of the number registered in the previous year, and exceeded the mean of the preceding 10 years ending 1890 by 118,077. By sexes there were 354,630 males and 328,047 females against 333,698 and 307,417 respectively in 1890.

The following table shows the number of births registered in each year from 1881 to 1891, their ratios per 1,000 of population, and the proportion of males to females:—

Years.	Population.	Number of Births Registered.			Ratio per 1,000 of Population.			In every 100 Births there were		For every 100 Male Births the Females were
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	
1881	16,454,414	239,912	219,745	459,657	14·58	13·35	27·93	52·19	47·81	91·59
1882	16,454,414	255,927	235,419	491,346	15·55	14·31	29·86	52·09	47·90	91·98
1883	16,454,414	261,966	239,835	501,801	15·92	14·58	30·50	52·20	47·80	91·55
1884	16,454,414	278,986	255,737	534,723	16·96	15·54	32·50	52·17	47·83	91·67
1885	16,454,414	298,406	274,025	572,431	18·14	16·65	34·79	52·13	47·87	91·83
1886	16,454,414	303,376	278,177	581,553	18·44	16·90	35·34	52·17	47·83	91·69
1887	16,454,414	327,500	300,693	628,193	19·90	18·27	38·18	52·13	47·87	91·81
1888	16,454,414	330,316	304,377	634,693	20·07	18·50	38·57	52·04	47·96	92·15
1889	16,454,414	312,974	287,515	600,489	19·02	17·47	36·49	52·12	47·88	91·87
1890	16,454,414	333,698	307,417	641,115	20·28	18·68	38·97	52·12	47·88	92·14
Mean for 10 years	16,454,414	294,306	270,294	564,600	17·89	16·42	34·31	52·13	47·87	91·84
1891	18,820,346	354,630	328,047	682,677	18·84	17·43	36·27	51·95	48·05	92·50

The recorded birth-rate for the year was 36·27 per 1,000 of population against 38·97 in 1890. It is satisfactory to notice that some improvement in birth registration has taken place in several districts.

For every 100 female births 108·10 male births were recorded, but this proportion was greater in several collectorates and districts.

The number of births recorded in each district in 1891 was higher than in the previous year. It also exceeded the mean of the preceding 10 years ending 1890.

Of the 24 collectorates, the number of recorded births in 1891 was higher than in 1890 in all the collectorates, except Thána, City of Bombay, Kolába, Hyderabad, and Shikárpur. In the City of Bombay the recorded birth-rate for the year was only 18·86 per 1,000 of population against 19·79 in 1890, whilst the mean ratio for the last 10 years ending 1890 amounted to 19·70 per 1,000 of population. Due attention is apparently not given to the registration of births in this city. Out of 56 towns in the Presidency the City of Bombay occupies the fifth place from the bottom of the list.

The recorded birth-rates among the urban and rural populations of the Presidency were respectively 28·63 and 37·34 against 28·40 and 40·52 in 1890. Among the rural population of each collectorate, except Ratnágiri, Bijápur, Kánara, Karáchi, Hyderabad, Shikárpur, and Upper Sind Frontier, the birth-rates were higher than in the urban population. In 1890 the birth-rates amongst the rural population were higher than in the urban population in each of the collectorates, except Kánara, Ahmedabad, Karáchi, Hyderabad, and Thar and Párkar.

Out of 56 towns in the Presidency 16 had a birth-rate exceeding 40 per 1,000. In many towns, however, little attention appears to have been paid to the registration of births. For instance, in the town of Thána a birth-rate of 12·43 per 1,000 of population was recorded against 7·54 in 1890, in the town of Alibág a birth-rate of 14·27 per 1,000 was registered against 20·86 in 1890, and in the town of Umarkot 21·90 against 34·30. In the towns of Násik and Broach the recorded birth-rates were respectively 22·41 and 27·30 per 1,000 against 18·51 and 25·88 in 1890. Birth-rates, such as those of Thána 12·43, Kalyán 13·24, Alibág, 14·27, Mahád, 17·76, City of Bombay 18·86, and those returned by Umarkot, Násik, Nasirabad, and Panvel are absolutely valueless. These and other municipalities, which have returned apparently equally inaccurate birth-rates, cannot be supposed to have been attending to their duties properly, and I hope Government will be pleased to call the special attention of the authorities to the necessity of much greater attention being paid to this most important subject.

Among the civil population in the rural, town, and cantonment circles in the Presidency, 513,132 deaths were registered during the year 1891. In 1890, 463,616 deaths or 49,516 less than in 1891, were recorded. The following statement shows the number of deaths recorded in each year since 1881 :—

1881	- 381,450	1885	- 473,591	1889	- 518,562
1882	- 343,418	1886	- 381,185	1890	- 463,616
1883	- 420,198	1887	- 455,261	1891	- 513,132
1884	- 408,409	1888	- 468,039		

The year under report, as compared with 1890, was, therefore, on the whole, an unhealthy one.

Of the total deaths registered 267,282 occurred among males and 245,850 among females against 242,835 and 220,781 respectively in 1890.

The computed death-rate per 1,000 of population in 1891 was 27·26 against 28·18 in 1890, and a decennial mean of 26·22. Omitting Sind, where registration is defective, the recorded death-rate in the other parts of the Presidency amounted to 28·83 per 1,000 of population.

The recorded death-rate per 1,000 of population was higher than in 1890 in the collectorates of Khándesh, Násik, Thána, City of Bombay, Kolába, Ahmednagar, Poona, Surat, and Broach. In the collectorates of Ratnágiri and Bijápur the recorded death-rates (19·77 and 31·24 per 1,000 respectively) during the year were nearly the same as those for 1890 (19·20 and 31·46). In the remaining collectorates it was lower than in 1890. The recorded death-rate per 1,000 of population in 1891 was higher than the annual mean of the preceding 10 years in all the collectorates except Thána, Sátára, Belgaum, Dhárwár, Kánara, Kaira, and Hyderabad. The death-rates 29·54 per 1,000 of population in Sholápur, 30·11 in Surat, 21·50 in Panch Mahāls, and 17·66 in Thar and Párkar were nearly the same as those of the annual mean of the preceding 10 years (29·32, 30·47, 21·34, and 17·55 respectively).

In the City of Bombay, the recorded birth-rate was much below the registered death-rate. It was 18·86 and 29·15 per 1,000 of population respectively; the difference may be partly ascribed to defective registration of births. In the collectorate of Broach the recorded birth and death-rates were nearly equal—42·54 and 42·11 per 1,000 respectively. In all other collectorates the recorded birth-rates were higher than the registered death-rates.

The mortality amongst infants under one year and children above one year but under five was, as usual, very high in comparison with other periods of life. In fact, the deaths among children under five years of age formed 43·79 per cent. of the total deaths. The period of greatest immunity was in the age of above 10 and under 15, the rate being 6·81 per 1,000. The percentage on total deaths amongst infants under one year was 22·18 against 21·22 in 1890. For those above one and under five the percentage on total deaths was 21·61 against 21·55 in 1890. Among old people 60 and upwards the percentage on total deaths was 14·29 against 14·62 in 1890.

According to the census of 1891, the Mahomedan population numbered 3,501,910 persons, amongst whom, in 1891, 76,401 deaths were recorded against 72,307 in 1890, the death-rate being 21·82 per 1,000 of population against 23·27 in 1890. The Hindu population amounted to 14,897,629 persons, amongst whom 431,153 deaths, or 28·94 per 1,000 of population, were reported. In 1890 the total deaths amongst this race were 386,095, equal to a death-rate of 29·41 per 1,000 of population. Amongst the Christian population, numbering 122,089 persons, 2,433 deaths were reported during the year against 2,270 in 1890, the death-rate being 19·93 against 16·41 per 1,000 in 1890. Under the heading "Other castes" are included all those not belonging to either of the above sects, who by the census of 1891 numbered 298,718 persons, amongst whom during 1891 there were 3,145 deaths against 2,944 in 1890, the death-rate being 10·53 per 1,000 against 36·65 in 1890. Among Mahomedans the maximum death-rate during the year (36·68 per 1,000) which is nearly the same as that of the City of Bombay (38·20 per 1,000), took place in the collectorate of Nasik, and the minimum (14·34 per 1,000) which is nearly the same as that of Hyderabad (14·85 per 1,000) in Upper Sind Frontier. In 1890 these rates were 39·77 and 13·59, and were reported as having occurred in Ahmedabad and Thar and Párkar. Amongst Hindus the maximum death-rate (46·83 per 1,000) in 1891 was in the collectorate of Broach and the minimum (19·10 per 1,000) in Hyderabad. In 1890 these rates occurred in Ahmedabad and Ratnágiri, 41·14 and 19·08 per 1,000 respectively. The maximum death-rate during the year amongst Christians was 36·14 and was reported from the Shikárpur collectorate, and the minimum (10·12) from Amednagar. In the collectorates of Broach, Panch Mahals, Hyderabad, and Thar and Párkar, no deaths amongst Christians were reported in 1891.

The subjoined table shows the deaths in 1891, arranged according to the specified causes laid down by the Government of India, and contrasted with the results for 1890 and the mean of the preceding 10 years. The causes of deaths will be briefly noticed in the next section:—

Causes of Death.	Mean for 10 Years, 1881–1890.		1890.		1891.	
	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.
Cholera	21,170	1·29	3,259	0·20	17,850	0·95
Small-pox	5,087	0·31	2,877	0·17	1,491	0·08
Fevers	296,021	17·99	344,897	20·96	368,913	19·60
Dysentery and diarrhœa	38,395	2·33	36,037	2·19	37,728	2·00
Injuries	5,781	0·35	5,883	0·36	5,887	0·31
Other causes	64,921	3·95	70,663	4·30	81,263	4·32
All causes	431,375	26·22	463,616	28·18	513,132	27·26

The recorded death-rates among the urban and rural population of the Presidency were respectively 29·45 and 26·96 per 1,000 of population against 29·80 and 27·96 in 1890.

Chief Diseases.

During 1891 cholera caused 17,850 deaths throughout the Presidency, or 14,590 more than in the preceding year and 14,581 less than in the year 1889. The epidemic was most prevalent in the Bijápur, Sholápur, Poona, and Ahmednagar collectorates, where 5,064 or 6·36, 2,442 or 3·25, 2,316 or 2·18 and 2,284 or 2·57 deaths per 1,000 of population respectively took place; whilst the minimum mortality occurred in the Broach, Shikárpur, Kánara, and Panch Mahals collectorates, in which there were 1, 6, 17, and 22 deaths respectively registered. Cholera.

In January cholera broke out in 11 collectorates and caused 256 deaths. In February the disease prevailed in 7 collectorates, causing 149 deaths, and ceased in 4 collectorates, namely, Násik, Poona, Belgaum, and Bijápur. In March 63 deaths were returned from 4 collectorates, the monthly minimum for the year. In April the disease somewhat increased and caused 214 deaths in 6 collectorates. In May 1,315 deaths were registered from 7 collectorates. In June it assumed a still greater intensity, and no less than 2,656 deaths were reported from 9 out of the 24 collectorates in the Presidency. In July the disease appeared to have assumed an epidemic form,

as 3,692 deaths were registered in 11 collectorates. During August the mortality rose to 4,443, the maximum for the year; the disease was present more or less in 13 collectorates. In September there was a slight decrease, 3,427 deaths in 14 collectorates. In October and November it rapidly subsided, as there were 901 deaths in the former and 414 in the latter. In the last month of the year the disease was only present in 6 collectorates, and 320 deaths were reported. During 1891 Surat, Kaira, Hyderabad, Thar and Párkar and Upper Sind Frontier were free from cholera.

The death-rate attained the high ratio of 6·36 per 1,000 of population; in Sholápur there was also a high death-rate, namely 3·25 per 1,000; whilst in the Ahmednagar, Poona, Khándesh, and Násik Collectorates the ratios were 2·57, 2·18, 1·35, and 1·15.

Out of the 25,143 villages in the Presidency, 1,594, or 7·79 per cent., were affected by cholera. The highest percentage occurred in the Bijápur collectorate, where out of its 1,110 villages, 434, or 39·10 per cent., were affected. In Sholápur, Poona, and Ahmednagar, the percentages were 30·15, 15·59, and 13·16 respectively. In the remaining 12 collectorates the rates were below 10 per cent.

Small-pox.

During 1891 there were 1,491 deaths from small-pox (747 males and 744 females) against 2,877 in 1890 and a decennial mean of 5,087.

In the Western Registration District small-pox attained a ratio of 0·15 per 1,000 against 0·20 in 1890 and a decennial mean of 0·41. In the Southern Registration District, the ratio was 0·11 against 0·30 in the previous year and 0·48 the decennial mean. In the Central Registration District it was 0·05 against 0·08 in the previous year and a decennial mean of 0·24. In the Gujarát and Sind Registration Districts the ratios per 1,000 of population were respectively 0·04 and 0·02 against 0·13 and 0·19 in the previous year and a decennial mean of 0·13 and 0·27. In collectorates the highest death ratio (0·24) took place in Khándesh and the lowest (0·00) took place in Ahmednagar, and (0·01) in Sholápur, Ahmedabad, and Shikárpur. The districts of Thar and Párkar and Upper Sind Frontier were free. The Presidency rate was 0·08 against 0·17 in the previous year and 0·31 the decennial mean.

Of the total deaths from small-pox 27·50 per cent. occurred among infants under 1 year of age, whilst 50·17 per cent. took place among children over 1 and under 12, the remaining 22·33 per cent. being among persons over 12 years of age.

Fever.

During 1891, 191,735 males and 177,178 females, or a total of 368,913 persons, were reported to have died from fever against 344,897 in 1890, showing an increase of 24,016 deaths for the year, the mean for the previous 10 years being 296,021.

According to districts the Gujarát Registration District fever caused a lower mortality (27·62 per 1,000) during the year against 29·54 in 1890 and the decennial mean 24·20. In the Western Registration District the death ratio was 20·97 against 18·32 in the previous year and 17·98 the decennial mean. In the Central and Sind Registration Districts the respective ratios for the year were 18·11 and 17·07 against 19·41 and 19·68 in the previous year and 17·18 and 15·18 the 10 years' mean. In the Southern Registration District the ratio for the year was 14·65 against 19·55 and 15·35 the previous year and the 10 years' mean respectively. In 10 collectorates out of 24 the fever death-rate was higher than that of the previous year. The collectorate of Broach heads the list with the very high ratio of 37·30 against 33·78 in 1890 and 29·20 in the previous 10 years. In the following collectorates high death ratios occurred:—Ahmedabad 31·44, Khándesh 27·21, Násik 25·95, Surat 25·35, Kaira 24·17, Panch Maháls 20·17, and Shikárpur 20·17,—the Presidency rate being 19·60 against 20·96 in the previous year and 17·99 the decennial mean.

In January and February and from May to December the deaths from fever were both above the mean of the corresponding months in the previous year. In March and April the deaths were below the previous year, but they were above the mean. The maximum mortality from fever took place in December, when 50,954 deaths were reported, and the minimum in June, when 25,628 deaths were recorded from this cause. A certain proportion of the mortality may be attributed to influenza.

Dysentery and diarrhœa.

During 1891 dysentery and diarrhœa caused the deaths of 20,663 males and 17,065 females, or a total of 37,728 persons against 36,037 in 1890, and a decennial mean of 38,395.

The Southern Registration District heads the list with the high ratio of 4·55 per 1,000 against 5·32 in 1890 and 4·51 the decennial mean. The Western Registration District comes next with a ratio of 2·78, the Central Registration District 1·78, the Gujarát Registration District 0·23, and Sind Registration District 0·15. In the Presidency the rate was 2·00 against 2·19 in the previous year, and a decennial mean of 2·33. Excepting in the collectorates of Khándesh, Násik, Kolába, Ahmednagar,

Panch Maháls, Thar and Párkar, Upper Sind Frontier and the Town and Island of Bombay the death-rate for the year was lower in all the collectorates. The highest ratios recorded were in Belgaum 5·69, Dhárwár 4·82, Bijápur 4·71, Khándesh 4·22, and Násik 4·18, and the lowest in Thar and Párkar and Shikárpur 0·07, and in Hyderabad 0·04.

During the year from January to April and in July and November the deaths from dysentery and diarrhœa were less than in 1890, but greater in the months of May, June, August, September, October and December. The maximum mortality occurred in September, and the minimum in February.

Injuries.

During 1891, 3,430 males and 2,457 females, or a total of 5,887 persons met with violent deaths. The mortality from these causes exceeds only by four that reported in 1890, when 5,883 deaths were recorded. Of the 5,887 deaths, 2,489 happened from drowning, 1,240 resulted from snake bites, 601 from wounds, 192 from hanging, 117 from poisoning, 92 from attacks by wild beasts, and 1,156 from causes not specified.

Other causes.

The recorded deaths from causes other than those specified number 81,263, of which 41,467 occurred among males and 39,796 among females. The total for 1890 was 70,663. There is a decrease of 10,600 under this head.

Sanitary Works—Military and Civil.

All available information under these sections has been thrown into a tabular form, and will be found in Appendices Nos. III. and IV., as directed in paragraph 5 of Government Resolution No. 3,393, General Department, dated 28th September 1888.

Personal Proceedings and General Remarks.

The important suggestions and recommendations made by the Army Sanitary Commission regarding information to be given in annual reports referred to in Government Resolution, General Department, No. 4416, dated 22nd December 1891, have received my most careful attention and consideration.

The cholera map has been reconstructed as much as possible on the lines laid down by the Army Sanitary Commission in paragraph 25 of memorandum No. 2, and more definite information is given in the tabular statements of sanitary estimates of towns consequent on an alteration in the form.

As regards the disposal of night-soil, shallow trenches and cultivation would undoubtedly be preferable to deep pits, but the difficulty is to secure a sufficiently large area near municipal towns, which the trench system demands. Deep pits are recommended on grounds of *economy only* where land is expensive and comparatively little demand for manure exists, as is the case at Násik, Sholápur, and other towns.

So far as my experience goes, the cause of sanitation has not in any way profited or prospered under local self-government. On the contrary, several towns have of late appeared to me to be growing more apathetic concerning this subject, which does not seem to be popular or fashionable at Congress meetings, although its importance demands that it should occupy the serious attention of the leaders of all such gatherings; for what can be of greater interest and importance than the health of the public, which has always been acknowledged to be "*suprema lex*"?

Shipping and Health of the Port.—A summary of the shipping and health of the Port will be found in the following table:—

Vessels including Native Craft.	Number.	Number of Passengers as far as is known.	Number of Vessels inspected.	Number of Persons, including Crew, inspected.	Number of Vessels disinfected.	Number of Persons vaccinated.	Diseases and Number of Cases of each.								Number of Boats with foul or rotten Cargo.
							Cholera.	Small-pox.	Measles.	Scarlatina.	Leprosy.	Chicken-pox.	Bovine Disease.	Equine Disease.	
Entered - - -	45,228	418,160	25	20,961	6	919	5	4	11	—	—	3	—	—	6
Left - - - -	37,333	360,219	722	82,048	2	32	—	3	—	—	—	—	—	—	—
In harbour including population -	1,455	22,142	22	—	22	49	43	5	—	—	—	—	—	—	10
Total - -	84,016	800,521	769	103,009	30	1,000	48	12	11	—	—	3	—	—	16
Total, 1890 -	87,316	723,377	651	70,851	21	1,408	4	14	13	—	—	1	—	—	5

Infected Vessels.—The actual number of ships which arrived with infectious disease on board is given in the following table :—

Class of Vessel.	Number of Ships.	Total Number of Crews and Passengers.	Diseases and Number of Cases of each.							Suspicious Cargo.
			Cholera.	Small-pox.	Measles.	Scarlatina.	Chicken-pox.	Bovine Disease.	Equine Disease.	
1. Troop-ships -	2	1,844	—	—	11	—	3	—	—	—
2. Pilgrim ships -	3	1,989	5	3	—	—	—	—	—	—
3. Other vessels -	1	273	—	1	—	—	—	—	—	—
4. Vessels with suspicious cargo (East African hides from ports).	6	72	—	—	—	—	—	—	—	6
Total - -	12	4,178	5	4	11	—	3	—	—	6
1890 - -	17	10,358	—	13	13	—	1	—	—	5

The measles cases on board of Her Majesty's Indian troop-ships were landed and isolated in the military cantonment at Colába. The pilgrim ships with small-pox cases were detained until the pilgrims and crew were vaccinated, and the vessels thoroughly disinfected.

Bills of Health.—The following table shows the total number of vessels bound for all quarantine ports which were inspected and granted Form B. Bill of Health :—

No.	Class.	Number of Vessels.	Tonnage (Net).	Total Number of Crews, Passengers, Pilgrims, and Troops.
1	Square-rigged vessels and steamers - -	520	945,623·08	42,951
2	Native craft - - - -	162	20,130·81	4,071
3	Pilgrim ships - - - - -	21	25,565·43	15,524
4	Her Majesty's Indian Troop and Marine ships -	19	83,140·50	19,502
	Total 1891 - - -	722	1,074,459·82	82,048
	1890 - - -	646	851,166·55	75,899

In addition to the above, Form C. Bill of Health was issued to 542 vessels. The total bills of health issued, including Form B., were 1,264 against 1,130 in the year 1890.

Quarantine.—During the year Suez imposed quarantine against Bombay arrivals from the 28th September to 15th October; this was due most probably to the outbreak of cholera on board of Her Majesty's ships "Marathon" and "Redbreast," which took place about that time.

Some of the Steam Navigation Companies complain, that notwithstanding a clean Government bill of health issued in Bombay, the Company's steamers sailing to Bussrah have to undergo a six days' quarantine there if they are not provided with certified medical officers. If a medical officer is carried the steamers are still subjected to 24 hours' observation. This quarantine is imposed in face of the fact that the bill of health granted to steamers leaving this port declares that there is no epidemic disease prevailing in the city and suburbs of Bombay. At Mauritius also quarantine is frequently needlessly imposed.

Treatment of Pilgrims at Camaran.—The pilgrim ship "Sculptor," which left Bombay on the 22nd April with 789 passengers, had, during the voyage between Bombay and Aden, four cases of small-pox, one of whom died and the remainder were landed at Aden. When the ship arrived at Camaran the pilgrims disembarked on the 2nd May to undergo the usual but unnecessary 10 days' quarantine insisted on by the Turkish authorities before they are allowed to land at Jeddah. While in the quarantine sheds at Camaran, and not on board ship, cholera broke out, and 20 pilgrims died. The pilgrims complained bitterly of the treatment they received at Camaran. They state that the Camaran authorities put them next to or in the sheds which were occupied by the cholera-infected pilgrims of the S.S. "Deccan," of the year 1890, that there was no medicine available on shore, that the water was brackish and undrinkable, and the place filthy—conditions eminently favourable for the development

and spread of epidemic disease amongst a class of people not remarkable for the observance of the rules of personal hygiene.

Medical Inspection of Passengers and Pilgrims.—The medical inspection of all passengers and pilgrims for European, Red Sea, and quarantine ports is most strict. No ship bound for any of the above ports is granted a bill of health until the crew and every person on board are seen by the Health Officer, who satisfies himself that they are free from infectious disease.

The Health Officer pointedly brings to notice, that although rigorous rules are enforced in Bombay, M. Henry Monod, the Director of the Assistance Publique and of the Department of Public Hygiene in France, and other writers persist in stating that no precautions are taken at Indian ports, that the medical inspection of pilgrims is permissive and not compulsory,—in fact, that pilgrims are never examined, and as a result that cholera is introduced into Jeddah, and in support of their statement give the S.S. "Deccan" and S.S. "Sculptor" as instances.

The Health Officer states that the "Deccan" and "Sculptor" are the only two cases which can be quoted against India for a number of years. But the pilgrims on board the S.S. "Deccan" never reached Jeddah. They were quarantined on shore at Camaran in July 1890 for 26 days, and as cholera did not cease they returned to India. The disease at the time was raging in Mecca, having previously broken out among a caravan of pilgrims from Damascus. In the case of the S.S. "Sculptor" in 1891, the pilgrims were undergoing the usual 10 days' quarantine, insisted on by the Turkish authorities, in the insanitary lazaretto sheds on the shore at Camaran when cholera broke out among them. As they did not proceed to Jeddah, but returned to India from Camaran, neither the "Deccan" nor the "Sculptor" can be blamed in any way for the spread of cholera among the pilgrims at Mecca.

The Health Officer states that he believes that when cholera reached Europe it had its starting point in Arabia, and as the question is one of international importance it would be well if the Egyptian Board of Health, with whom should be associated an Indian medical officer, directed their attention to the sanitary condition of the Haj cities, more especially Camaran, El Tor, Jeddah, Mecca, and Medina.

Foreshore.—The general sanitary condition of the foreshore has been improved to a certain extent by portions of it being railed off to prevent nuisances being committed.

Arthur Basin.—Arthur Basin has improved considerably owing to the cessation of the discharge of the tramway stables drain, except at high water, but the Port Trust authorities should insist on the tramway company extending the discharge pipe from their stable through the basin to below low-water mark, so that the outfall should always remain submerged.

Colába Night-soil Depôt.—The discharge of night-soil into the harbour from the Colába Depôt at all states of the tide still continues, although attention has been drawn to the subject repeatedly.

Victoria Boat Basin.—The Victoria Boat basin and the foreshore up to the Gun Carriage basin are in a foul condition. Part of this foreshore, which is the property of the Colába Land and Mill Company, is in a most filthy state, and the Company should be compelled to erect latrines for their workpeople.

Back Bay.—The Health Officer draws special attention to two places in Back Bay, viz., a drain situated to the north of Colába Pársi Sanitarium, close to the new block of buildings erected by Government. It discharges on to the sand a most foul smelling black liquid. The other, a sewer, which discharges into Back Bay, close to the Marine Lines Station. This sewer is an offshoot of the one which runs through the Marine Lines and Queen's Road, and not supposed to discharge sewage matter, unless when the main drain gets damaged or blocked from deposit. Nearly all the night-soil from the Marine bungalows finds its way into the main drain and frequently into Back Bay.

ABSTRACT OF REPORT OF THE CALCUTTA MUNICIPALITY FOR 1891-92.

(*Mr. H. Lee, Chairman.*)

Drainage.—Mr. Baldwin Latham's Report and Mr. Kimber's Note on it led to a prolonged and somewhat intricate correspondence between these two Engineers, which has but now reached a stage in which it can be considered by the Commissioners. The points of variance are of such importance, and so surrounded with technicality, and such large sums of money are involved, that, in my opinion, it may be found necessary for the Commissioners to invoke the aid of outside experts to advise them in coming to a decision.

But it is pretty certain that no actual works can be commenced yet, for Mr. Kimber agrees with Mr. Baldwin Latham, and the Commissioners are not likely to disagree, when he says :—

"In my judgment no work ought to be undertaken in reference to the surface water scheme, or sewerage works in connexion with Calcutta or the Added Area, until proper tidal observations and surveys have been made, and the various matters referred to in the reply to the notes have been ascertained, for if you do proceed with these works without such information, it would be very much like shooting in the dark."

Pollution of sub-soil.—On one important matter the Health Office and the Engineer have for years differed, and they do not even now thoroughly agree. Dr. Simpson has always maintained that the older sewers of Calcutta are continually polluting the sub-soil. Mr. Kimber has as steadily denied that this is the case: here and there a pipe might be out of order, and be the source of pollution for a few feet round it; but such were very rare exceptions to the general rule, which is that the sewers drain away the sub-soil water, and do not pollute the sub-soil at all.

Mr. Baldwin Latham's report is strongly confirmatory of Dr. Simpson's contention. He observed that "sewers like the Calcutta sewers, that are likely to be gorged with "mixed sewage and rainfall, must let the sewage out into the sub-soil, which becomes "a reservoir for its reception when the flow increases in the sewers. This constant "interchange of sewage, rainfall, sub-soil water, and tidal water between the sewers "and the ground is, in my judgment, extremely prejudicial to the health of the in-"habitants of Calcutta." And again "all pipe sewers should be jointed with tarred "gasket and Portland cement mortar, and not with clay, or a mixture of clay and "Portland cement; the clay being a material liable to considerable shrinkage if it dries, "and if it does not dry, then it remains soft and plastic, and the weight of the earth "filling of the sewer trench squeezes out the lower part of the jointing material, "leaving an opening at the upper part of the pipe joint through which sub-soil water, "earth or sand may enter the sewers, or when the sewers are overcharged, the sewage "may escape into the sub-soil."

Finally he remarks :—

I have very carefully looked through the health statistics of Calcutta for some years past, and have perused the carefully prepared and exhaustive reports of Dr. Simpson, your Medical Officer, and I regret to find that it appears from the figures, and from the reports of your medical staff from so long a period ago as 1874, and up to the present time, that the attention of the authorities of Calcutta has been directed to the enormous good that has resulted from the supply of good water to the city, but on the other hand, their testimony has been against any improvement having been secured by the works of sewerage. After inspecting these works of sewerage, and ascertaining the state of affairs, to which I have drawn your attention, I should have been surprised if any sanitary advantage could have arisen from such works, but I am clearly of opinion, as I am of my own existence, that with a proper system of sewerage in Calcutta, the benefit would be as certain as those which have arisen from the supply of good water, and when the defects in the present system of sewerage now pointed out are remedied, you may rely upon securing the good results to health which have followed in every town, to my knowledge, that has been sanitarily drained.

Quotations from works of first rate authority were adduced before me to show that the soil must be contaminated from such sewers as our older ones, and that in every part of the world where sewers jointed like them have been laid, the sub-soil has been

contaminated. On the other hand I was shown the anonymous writings of a contributor to an engineer's periodical, maintaining that there could be no such contamination, and that as a matter of fact in Calcutta there was none.

The question, whether or not the sewers do pollute our subsoil, seemed to me one that any body possesssed of a little patience could easily settle for himself. Accordingly on the 26th April 1892 I examined for three hours, with the utmost care, three sewers that had been partially stripped for me beforehand, in the north part of the town. I then had many of the joints entirely bared, together with several connexions from the neighbouring houses. I took full notes of all that I observed, and collected specimens of the earth and water surrounding the sewers, and of the contents of the sewers themselves, and had the specimens analysed. Again on the 30th April I repeated my observations, for two hours visiting four other sewers, besides re-examining two of the three that I had visited on the 26th. Finally, with the sanction of the Commissioners, I had 30 wells sunk in different parts of the city, three at different parts of the maidan which is unsewered, and the rest at intervals of from two to 40 yards from the nearest sewers, and had the water from many of them analysed.

The actual facts thus established are, that the older sewers of Calcutta do pollute the subsoil in their immediate neighbourhood, but the area of contamination remains still to be determined. My observations did not go to show that the newer sewers do at all pollute the subsoil, but on the contrary, the only two sewers laid within the last nine years, one in the 1883 and the other in 1886, that I examined were found to be well laid and thoroughly water-tight. I have also watched the laying of very many pipes for the last two years, and they have all been properly jointed. All pipes that have been laid since Mr. Baldwin Latham wrote his report, have been jointed in the manner recommended by him.

It seems to me that I should be wanting in my duty if I did not here record my conviction, that it will be henceforth the duty of the Commissioners to set aside yearly a considerable sum of money till they have cemented all the joints of all the old sewers.

It has been objected that such a course would inevitably raise the level of the sub-soil water. That may be so or not. I have given considerable attention to the point, and am by no means convinced that such would be the result. But whether the sub-soil water is raised or lowered thereby, there can be no doubt that the joints of the old sewers, like the joints of the new, should be water-tight.

Sanitary zeal.—The subject of securing, at a cost of about Rs. 6,000, the services of the renowned sanitary engineer, Mr. Baldwin Latham, to report upon the drainage of the city was touched upon in last year's report. A similar step to obtain "more light" was taken by the Commissioners this year, when they determined to depute their Health Officer to England to attend the International Congress of Hygiene, and to visit the various cities and towns of England in which refuse is burnt. I wish particularly to congratulate the Commissioners on the sanitary zeal of which these two decisions are striking evidence.

Quarantine.—The paper on cholera that Dr. Simpson read before the Congress in London was well received, and cannot fail of its effect. In it he proved conclusively that Calcutta is not, and cannot be the source of cholera imported into Europe, and that "if Mecca and Jedda were once recognised as the principal and most dangerous "centres of cholera so far as Europe is concerned, and as the only probable source of "importation of cholera by sea, a great boon would be conferred on the maritime "trade between Europe and the East, which is at present so often hampered by "unnecessary detentions and restrictions imposed by quarantine."

Incinerators.—The memorandum that he prepared on the Incineration of Refuse will be found quoted in full in his report for this year. It is complete in all respects, and lucid as his reports always are. It was chiefly owing to the facts and arguments adduced in this report that a contract was entered into with Mr. Harrington for the erection of a new and improved incinerator for the destruction of suburban refuse. The site chosen is on the southern boundary of the municipality, between the docks, and near the Diamond Harbour Road. The incinerator is at the present moment all but completed, and will be in full working order by the middle of July.

When the system of incineration becomes general throughout Calcutta, as it certainly will be some day, the financial relief to the ratepayers will be considerable, whilst the sanitary benefits will be simply inestimable. All the filth that is now transported at the cost of about one lakh of rupees a year to poison the air at a short distance from

Calcutta, will then be converted at no greater cost into wholesome and valuable ashes. One of the most eminent members of the medical profession (Sir Spencer Wells, Bart., F.R.C.S.) addressing the Calcutta Medical Society on the 5th of January 1892, said:—

I did not know before I came to India, but I have learned within the last few days, that tetanus is far more common here than in Europe. Two years ago, my friend Dr. O'Brien, of Darjeeling, formerly Health Officer for Calcutta, asserted at one of the meetings of the Corporation, that in this city more deaths occur in a single year from tetanus than in the whole of England in a similar time, or in the whole of Scotland in ten years. He said that in the previous ten years nearly 12,000 people had died of tetanus in this city, and that it was beginning to rival cholera in the mortality which it causes. Infants appear to be peculiarly liable to tetanus. The infant mortality in the ten years 1881–90 from this disease almost equalled that from all other infantile diseases added together. Your present Health Officer, Dr. Simpson, informs me that although every case reported in 1890 has been visited by a Medical Inspector, and all doubtful cases eliminated and placed to the account of other causes, yet 512 infants died of tetanus in Calcutta in 1890. Dr. O'Brien (impressed by Pasteur's demonstration of the microbic origin of the disease, and the fact that it shows a remarkable tendency to appear near the tanks or marshes or salt lakes polluted by daily additions of the refuse of the city) used this among other grounds for attempting to improve the present mode of disposal of the refuse, advocating strongly its cremation or incineration. A report on the incineration of refuse by Dr. Simpson is to be considered by the Corporation next week. I visited the Incinerator in Circular Road this morning with the President, Mr. Lee, and with Dr. Simpson, and feel sure they are right in believing that with a well-constructed furnace and chimney all the smoke and offensive vapour (which led to the temporary disuse of the refuse destructor) may be completely burned up before they escape at the top of the chimney. In London, close to Waterloo Bridge, in the midst of a crowded population, eighty tons of city refuse are destroyed every day. It is only when the stokers are careless that anything visible escapes from the chimney, and nothing offensive annoys the neighbours. I sincerely hope the Corporation will at once support their President and Health Officer in their praiseworthy efforts to improve the health of the inhabitants of Calcutta and the suburbs, by safely destroying by fire every day all the refuse of the population. I quite agree with Dr. O'Brien in his assertion that "it would be impossible to conceive anything more shocking or more insanitary than the present method of disposal of the refuse of the city." Just think of scattering 60 huge waggon loads of street sweepings, offal from slaughter-houses, decaying animal and vegetable matter—25,000 cubic feet of putrescent filth—upon the marshes of the Salt Water Lakes, which closely border the city to the eastward and the densely populated suburbs leaving the filth to ferment under the heat of a tropical sun! Can anything be more likely to cause some terrible pestilence than the conservation of such a factory of poisonous malaria, ready to be blown by prevailing winds towards the homes of the inhabitants? Is it not wonderful that filth-fevers are not more prevalent? Is not Dr. O'Brien probably right in his belief that the germs of tetanic microbes are so preserved and cultivated and spread?

Attention is invited to that portion of the Engineer's Report which describes the completion of the new pumping station at Bhowanipore. The works which, including the street piping, having cost the Commissioners approximately 15 lakhs of rupees, are the most perfect of their kind, and it will be seen that they have been carried out with marked energy.

The engines are the manufacture of Messrs. J. Simpson and Co. and are thus described in a professional periodical.

The engines are direct-acting triple expansion condensing horizontal Worthington engines, and they differ from any existing pumping engine, inasmuch as there are no fly-wheels, crank-shafts, connecting rods, or any other of the extra gear necessary for the efficient working of all rotary engines. These engines are arranged so that one engine in advancing moves the valves of the other by means of a single lever linked to the piston rod. The movements of the pistons and plungers are simply backwards and forwards; as one is just coming to rest the other begins to advance, the water column is never allowed to come to rest; the speed is constant; the flow of water absolutely uniform, and the stillness of the engine room is only disturbed by the sharp hiss of the exhaust steam as it rushes into the condenser. What we are particularly struck with is the smallness of the foundations and engine house required, as we are used to seeing pumps and rods attached to ponderous beams, supported on foundations disappearing to a vast depth, and the absence of all vibration either in the foundation or in the mains. It seems marvellous that such a plant as that at Bhowanipore should be capable of delivering 13 million gallons per day.

New Roads.—Harrison Road.—At the time that I write, the magnificent road is practically completed that the Commissioners have been engaged upon for the last three years, running in nearly a straight line through the heart of the city from the Hooghly Bridge to the Sealdah Railway. It has but lately been named the Harrison Road in commemoration of Sir Henry Leland Harrison, Kt., who was for nine years Chairman of the Corporation, and whose recent and sad death Bengal deplores. I have already described the principles that guided the Commissioners in acquiring the land, constructing the road, and selling off surplus land. In the course of the year the Commissioners entered into a contract with Messrs. Laing and Wharton to light the

road throughout with electricity, and we expect to see the lights burning this month (July 1892). The system to be adopted is nearly uniform with that followed by the same firm in the lighting of the Hooghly Bridge. The dynamos are placed at the Halliday Street Pumping Station, which bisects the road. The cost of installation will be Rs. 91,885. If to the interest on capital outlay we add a yearly charge of, say Rs. 2,470 for maintenance, working, and establishment, we see that the cost is but slightly in excess of what would have been the cost of a complete system of gas lamps, for the road is over 1½ miles in length, and clusters of gas lamps would have been needed at all the most important crossings. The charge for each gas lamp would have been Rs. 54 or 60 yearly, according to the terms arranged with the Gas Company.

Acting under the advice and with the kind assistance of Dr Prain, of the Botanical Gardens, an avenue of mahogany trees has been planted on the two sides of the road. As the mahogany is a slow growing tree, we have also planted an avenue of gold mohurs which will serve as nurses to the young mahogany trees, and will afterwards be removed.

Another fine new road that has been completed is the extension of Lansdowne Row to Beltala Road, which it meets not far from the Ballygunge Circular Road. It has cost about Rs. 1,13,014.

Other large new roads are in contemplation, and several most useful roads, though not broad or long, have been or are being constructed in various parts of the city and suburbs.

Improvement of the Suburbs.—In the Resolution on last years Report, his honour the Lieutenant-Governor expressed his wish that the manner in which the Commissioners discharge their statutory obligation to expend a sum of not less than 3 lakhs of rupees annually on the improvement of the suburban area added to Calcutta by Act II of 1888, should be prominently brought forward. The question has from the beginning been debateable just what expenditure is debitable to this charge of 3 lakhs and what is not. The Commissioners, therefore, apointed a Special Committee, at the beginning of the year now under review, to report on the principles that should be held to apply, and to prepare a statement of the accounts of the fund up to the 31st March 1891. The Committee which consisted, under my presidentship, of Sir Henry Harrison, Baboos Kallynath Mitter, Nolin Behary Sircar, Norendro Nath Sen, Priyanath Mullick, and Lal Behary Bysick, submitted the report and statement of accounts which appears amongst the Appendices, but when these came before the Commissioners in meeting certain legal points were raised which the Commissioners decided to refer to Counsel for opinion. In this form the matter is still pending. Meantime I have had prepared a statement of accounts for 1891–92 on the same lines as the previous statement, and I add that to the Appendix, thus bringing the matters up to date. Last year we spent on new and important works in the suburbs Rs. 8,51,071, viz. :— on the extension of the water supply pipe, Rs. 2,94,422, on Bhowanipore pumping station, Rs. 2,71,078, on the making of a fine road in extension of Lansdowne Row, Rs. 1,13,014, on a similar road east of the Bhowanipore pumping station, Rs. 15,684, on a smaller road south of the station, Rs. 10,187, on hackney carriage stand, Rs. 8,050, on Dhobeekhannah, Rs. 25,162, on survey for drainage of suburb, Rs. 22,757 on the drainage of the fringe area between the Circular Road and the Circular Canal, Rs. 29,447, on drainage of Russa Road, Rs. 2,962, towards the cost of the new Incinerator at Goragatcha, Rs. 9,800, and on the other petty improvements, Rs. 53,384.

Town Improvements.

This subject may be conveniently treated of under six heads, viz :—

(1.) Structural improvements of bustees in Calcutta.
(2.) Bustees in the added area.
(3.) Water-supply to bustees.
(4.) Latrines and urinals.
(5.) Obliteration of foul tanks and wells.
(6.) Structural improvements in the streets of the town.

Structural improvements of bustees in Calcutta.—So far as the expenditure is a guide, this work has been pushed on during the year with considerable energy. The Commissioners are pleased to be able to record a better out-turn of work under this head than in any previous years since the improvement of bustees was first taken in hand in 1882–83.

It will be seen from the annual report of 1890–91, page 8, that the balance available for bustees and structural improvements for 1891–92 was Rs. 87,815-7-2. The

Commissions, however, instead of bringing forward this amount to carry out the improvements of the year, as was hitherto done, sanctioned the following amounts on this account :—

(*a.*) Bustee improvements, Rs. 1,00,000.
(*b.*) Latrines and urinals, Rs. 14,000.
(*c.*) Latrines and bathing platforms, Rs. 10,000.
(*d.*) Contribution on account of petty town improvements from General Revenue, Rs. 30,000, making a total of Rs. 1,54,000 available for bustee and town improvements during the year.

The expenditure actually incurred and adjusted in the accounts has been :—

	Rs.
Town improvements	36,102
Acquisition of land for roads	32,601
Construction of roads	72,281
Construction of bathing platform	7,662
Compensation for removing huts	7,819
Tank-filling	17,321
Construction of squares	67
Latrines and urinals	10,083
Contingencies	7,399
Total	1,91,335

Filtered water supply to bustees.—Every impure well and foul tank in a bustee filled up by order of the Commissioners has increased the demand on the filtered water supply and made it more incumbent on the Commissioners to do what they can to replace the impure by pure water in bustees. For a short time the supply of filtered water to bustees was disallowed, but after a full and deliberate consideration, the Commissioners came to the conclusion in the course of the year that such a prohibition was both unjust and unwise, and should be abandoned in favour of a liberal policy. They now allow connexions on certain scales which has been freely taken advantage of with satisfactory results.

It was also decided that permission should be given to bustee-owners, to construct covered reservoirs for filtered water, provided with automatic ball-cocks. The boon would be immensely appreciated by the tenants, who being men for the most part, who get back home after their day's work late in the evening, find the pressure gone from the main, and would be greatly relieved to know that there was always a fresh supply of pure water waiting for them in the reservoirs. No one has yet appeared to set the example of constructing such reservoirs, but as soon as it is set, others will rapidly follow it. At present the proffered concession is not widely known, and it is not known how inexpensive the reservoirs will be. The cost of such a reservoir estimated to hold 400 gallons, will be, all told, but Rs. 65.

Bathing platforms.—The demands of the public for unfiltered water for the streets and for flushing the sewers and for the bathing platforms (84 in number) already in existence, are so heavy, especially during the hottest months of the year when the need of extra bathing platforms is chiefly felt, that caution must be used not to increase the number of platforms beyond the capacity of the pumping station to supply them with water. The utmost that the Commissioners felt themselves justified in sanctioning was the construction of three new bathing platforms, and the enlarging of five old ones. The two new platforms constructed during the year are to be found, one in Kripanath's Lane in Ward 2 (Coomertooly), and the other in Marcus Square. They cost Rs. 1,488 and 3,129 respectively. The former will accommodate the largest number of bathers of any platform and the latter is the best arranged in the town. Land for the third is being acquired.

Before selecting the five platforms to be enlarged, a census was taken of the number of persons using the various platforms throughout the town. The months chosen were March and April 1890. Between the hours of 6 a.m. and 9 p.m. no less than 63,886 males and 26,057 females were found to have bathed at the 76 platforms. At one (in Mitter's Lane) no less than 5,344 persons had bathed, and at another (Goaltolee Lane) 2,825 persons, whilst the least frequented (34, Shambazar Street) was visited by 501 persons.

The selection of the platforms to be improved, and the best method of improvement gave rise to discusion, but in the end the five platforms were selected for enlargement which are situated in—

161 Upper Chitpore Road.	61–1 Champatola Lane.
84 Machooa Bazar Road.	31–1 Lower Chitpore Road.
71 Upper Circular Road.	A new bathing platform constructed near Mitter's Lane.

And the sanction of Government has been asked for the acquisition of the lands needed for the purpose. When the arrangements now under consideration have been completed for increasing the pumping power at Mullick's Ghat and working the engines day and night, a further advance in the supply of bathing platforms can be made, but not till then.

Latrines and urinals.—The most approved modern urinals for use in crowded places are known as McFarlane's patent, of which conspicuous examples are seen at the south-west corner of Dalhousie Square and the south-west corner of Wellington Square. The contrast is marked between these commodious and absolutely inoffensive structures and the foul and indecent necessaries that they replaced. There were but three such urinals three years ago, and now we have of these no less than 12, which were erected during the year under review. The sole objection to these urinals is their expense. Each one cost on the average Rs. 857.

Obliterations of foul tanks and wells.—Tank filling has been pressed on with energy during the year, and three tanks have been filled up by the Corporation in addition to 13 filled up by their owners. In three cases the owners have been allowed to de-water and improve their tanks. The tank at No. 11–1 to 11–3 Ram Kissen Dass' Lane is being improved by the Corporation at the cost of the owners. In accordance with the resolutions of the Commissioners so far back as 1884–85, several tanks were acquired for public purposes, viz., a tank at 294–295, Circular Road Upper for a dumping ground, a tank in Woolfut Bagan, and the Puddopooker tank in Bhowanipore. In cases where the tanks have been filled up by the Commissioners, and the owners have refused to pay the cost, possession has been taken by the Corporation. Boundary stones have been erected, and the grounds are being used for various useful purposes.

Structural improvements in the streets of the town.—The street improvement grant from revenue was, as usual, Rs. 30,000. This was for petty improvements only; all larger and more important constructions being undertaken from the Loan Budget. These improvements are, of course, also independent of all works carried out as bustee improvements. The expenditure incurred on this account, as adjusted during the year, was Rs. 36,102–6–4.

It will be understood that the Rs. 30,000 covers only local and comparatively petty improvements. The larger structural improvement, such as the Harrison Road running from Howrah Bridge to Sealdah Station, the extension of Lansdowne Row, the new road running from the Circular Road past the Bhowanipore pumping station, the new road running from it into the Russa Road and other works paid for from special funds or from the three lakhs devoted to the improvement of the amalgamated area are enumerated and described in the Engineer's report.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR 1891.

(*Dr. W. J. Simpson.*)

More importance is always attached by sanitarians to a census year, because of the accuracy of the population standard to which the vital statistics can be reduced, and because it affords a favourable opportunity of passing in review the statistics of the period which has intervened between the former census and that just completed. I shall, accordingly, deal with the statistics of Calcutta somewhat more fully this year than usual.

Results of Census of 1891.

Beginning with the census. It was taken on the night of the 26th of February, and the population of Calcutta, including that portion of the suburbs which was amalgamated with the town three years ago, was found to be 681,560 inhabitants, comprising 234,814 females and 446,746 males.

——	Males.	Females.	Total.
In the old town - -	287,032	149,371	436,403
In the added area -	128,007	84,991	212,998
In the fort - -	3,119	349	3,468
In the port - -	26,516	73	26,589
In the canals - -	2,072	30	2,102
Total -	446,746	234,814	681,560

No comparison can be made between the area included in 1891 and that of 1881, for they do not correspond, and therefore the remarks which follow apply only to the town proper, *i.e.*, the old town inclusive of the Port and Fort.

The old town or urban Calcutta has increased during the last 10 years from 433,219 to 466,460, adding therefore to its population 33,241 inhabitants; of these 27,850 were males and 5,391 females. Nearly the whole of the increase has been among the Hindoos, the Mahomedans and Christians having added but slightly to their numbers, while that part of the population coming under the heading of Other Classes has considerably decreased. This is shown in the following table:—

Races.	1881.			1891.		
	Male.	Female.	Total.	Male.	Female.	Total.
Hindoos - - - -	180,084	98,678	278,762	206,449	105,366	311,815
Mahomedans - -	90,667	33,763	124,430	93,472	32,683	126,155
Christians - - -	13,708	9,047	22,755	13,453	10,115	23,568
Other Classes - - -	4,358	2,914	7,272	3,293	1,629	4,922
Total - - -	288,817	144,402	433,219	316,667	149,793	466,460

A comparison of the births and deaths in the 10 years from 1881 to 1890, will give some information as to the manner in which this increase takes place. During the 10 years over 122,000 persons or nearly 30 per cent. of the population died. Had there been no births or immigrants the population would have stood at a little over 310,000 in 1891. Every town replenishes its losses more or less by its births; and in the vast majority of instances the reproductive power is much in excess of the destructive, showing a favourable balance in an excess of births which is called the natural increase. This, however, is not the case in Calcutta, as may be readily seen from the diagram in which the annual births and deaths are compared for 21 years. In the last 10 years,

from 1881 to 1890, there were, assuming the registration of births to be fairly complete, only 80,386 births, a number which falls far short of that of the deaths. The loss by deaths has not been made up by a gain in births, for instead of there being, as in most towns, 3 births to every 2 deaths, there were in Calcutta 3 deaths to every 2 births. When the 80,386 births are added to the 310,528 people surviving in Calcutta, the population amounts to 390,914, which is less by more than 42,000 than the population in 1881. It therefore requires that number of people to have come in fresh from other parts of the country, or elsewhere, to keep the population of 1891 up to that of 1881. But the census shows that Calcutta, instead of diminishing in numbers during that time, has actually increased some 33,000. These also must be new-comers, and the surprising fact presents itself that in the 10 years at least 75,000 people must have come to Calcutta to fill up the gaps caused by the deaths in that period and ensure the increase of population. But all this is on the assumption that not a single person, who resided in the town ten years ago, and who, during the decennium has escaped death, has emigrated from Calcutta. Common experience teaches us that this is not so, and that many have left the town. The number cannot be proximately estimated, but probably not less than 25,000 have left in the 10 years, which means that at least 100,000 immigrants have come to Calcutta during the past 10 years. The census returns show that 55 per cent. of the inhabitants of Calcutta were born elsewhere. Calcutta, then, owes its maintenance and increase of population to immigrants. It is peopled at the expense of other parts of India and elsewhere. The people come trooping in, and in the course of time disappear in what has been termed the "devouring whirlpool of a town." This large floating population considerably affects the health statistics of the town and the deductions to be drawn therefrom.

Only 30 per cent. of the total deaths are children under 5 years of age, whereas in English towns it ranges between 35 and 45 per cent. of the total deaths. This would give a very fallacious view of the real death-rate among children in Calcutta, were the fact not to be remembered that Calcutta is peculiar in possessing so small an infantile population. We shall see later on that the death-rate among children is high.

The death-rate of females is much higher than that of males. In the town during the 10 years the average has been for females 34·5, against 25·4 for males, and in the suburbs, for 1891, it was 40·2, against 33·3. A probable explanation of one of the causes of the higher death-rate of females in Calcutta is that, once settled here, they are, generally speaking, more permanent residents, and, unlike a large part of the floating male population, do not go home to their country when ill or about to die.

The age at which the death-rate falls heaviest on the population is given below, and also the mortality at the different periods of life as compared with the mortality at the same periods of life in England. Probably the comparison is not a fair one. It would be fairer to compare these figures with similar ones belonging to other cities in India, but the figures for this purpose are not available.

Population, deaths, and death-rates per 1,000 *at different periods of life.*

Ages.	Mean Population, 1881–1891.		Annual Mean Deaths in 10 Years, 1881–1890.		Annual Mortality per 1,000 living during 1881–1891.		England and Wales, 1870–1881.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
All ages - - -	302,742	147,097	7,054	5,002	23·3	34·0	22·6	20·0
Under 5 Years -	14,930	13,824	1,981	1,715	132·6	124·0	68·1	58·1
„ 10 „ -	15,021	13,345	277	240	18·4	17·9	6·7	6·2
„ 15 „ -	19,188	10,883	164	141	8·5	12·9	3·7	3·7
„ 20 „ -	25,189	11,426	424	292	16·8	25·5	5·2	5·4
„ 25 „ -	34,177	12,887	621	314	18·1	24·3	7·3	6·8
„ 35 „ -	79,287	29,155	1,114	543	14·0	18·6	9·3	8·6
„ 45 „ -	69,690	28,090	948	436	13·6	15·5	13·7	11·6
„ 55 „ -	33,899	17,735	574	319	16·9	17·9	20·1	15·6
55 and upwards -	11,359	9,751	951	1,002	83·7	102·7	98·	82·
1 year -	3,188	2,784	1,398	1,160	438·5	416·6	197·4	157·3

It will be noted that at all ages there is a difference in the mortality as compared with what obtains in England. The death-rate under 5 years is in Calcutta twice as great, between 5 and 10 years nearly three times, between 10 and 15 more than

double. between 15 and 20 more than three times in males and nearly five times in females, and between 20 and 25 more than double in males and treble in females of the English death-rate at the same respective ages. After 35 years the death-rates of Calcutta and England approach one another more closely. As regards sex in relation to mortality in Calcutta, it will be observed that under 10 years of age the mortality of males is greater than that of females, but above 10 years of age the mortality of females is much higher than that of males. This is specially the case between the ages of 15 and 20, when 25 females die to every 16 males, and between the ages of 20 and 25, when 24 females die to every 18 males. Whether this is due to the influence of child-birth between these ages I am unable to say. The general death-rate may be further examined in its relation to the age distribution. In England and Wales over 13 per cent. of the population are children under 5 years of age, nearly 76 per cent. are persons between 5 and 55, and 10·5 per cent. are persons aged 55 and upwards. In Calcutta only 6 per cent. of the population are under 5 years of age, no less than 87 per cent. are between 5 and 55 years of age, and only 6 per cent. above 55. The two periods of life which raise the death-rate of a town or country are those in which the vitality is low, *viz.*, the two periods below 5 years of age and above 55. For adjustment of any death-rate it is therefore necessary to consider the influence which may be exerted on the general death-rate by these two factors. Calcutta is peculiar in possessing a comparatively small population at both the high mortality ages, and has accordingly always a very much more favourable death-rate record than a town in a better sanitary condition, but with a larger number of its population under 5 and over 55 years of age. With this very important point in its favour, the Calcutta general ratio compares favourably with other towns, but when the age death-rate is examined the figures show a high death-rate for Calcutta.

It is on this age death-rate that the sanitary condition of the town requires to be judged, and the verdict must be that, though improving, it is still bad. It would be a matter for surprise if it was otherwise, for the condition of many parts of Calcutta are as insanitary as they well could be. The insanitary localities of Calcutta will never become healthy until proper building regulations have been adopted and have been in operation for a number of years. A favourable season is only needed for such localities to become extensive breeding grounds for disease which spreads beyond their boundaries. Burrabazar, Jorabagan, and Coomertooly might very well be treated as one large unhealthy area, and a wide street run through from north to south. Fresh air would thus be admitted to these badly ventilated quarters, and the great congestion which prevails there would also be relieved. But unless this work of demolition is accompanied by the enforcement of proper building laws and regulations, which are at present not in existence for Calcutta, the good effects of the demolition would be only temporary.

Vital Statistics of Urban Calcutta.

Vital statistics.

There were in urban Calcutta during the year 1891, 8,256 births, giving an annual ratio of 17·6, against an average of 17·1 for the past decennium. This is higher than all the corresponding ratios of the past decennium, except 1885, 1888, and 1889.

The year 1891 was not a healthy one. The general mortality was comparatively high, being surpassed by the ratios of only three years in the decennium. The figures are as follows :—

	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.
25·8	28·9	29·2	27·2	29·2	24·5	23·5	25·0	25·0	26·5	27·9

The number of deaths amounted to 13,033, which gives a death-rate of 27·9, against a decennial mean of 25·8; the increase in mortality was chiefly due to a larger number of deaths from fever and cholera. A comparison of the death-rate of each ward with each of their decennial mean death-rates shows that there has been an increase in the death rate in 13 of the 18 wards in the town. The Hindoos' death-rate was higher than that of the Mahomedans; the former being 29·8, the latter 24·1. Females as usual died at a more rapid rate than males, the ratios being respectively 35·2 and 24·4. Infants under one year of age had a higher rate of mortality in 1891 than in the two preceding years; their death-rate was equal to 418 per 1,000, against 273 and 313 in 1889 and 1890.

The deaths from cholera in 1891 amounted to 1,553, against 963 in 1890. The figures for the four quarters of the year were: 1st quarter, 810 deaths; 2nd, 182; 3rd, 126; 4th, 435. The excessive number of deaths during the first quarter was due to the outburst of cholera at the Ardhodaya Jog. I entered very fully into this subject in my supplemental report attached to the Annual Report of 1890, and it will now be unnecessary to more than refer to the subject. One extract may, however, be given, as it deals with the rapid rise in the cholera death-rate, both in urban and suburban Calcutta at the time of the Jog. Cholera.

Statement showing the Number of Cholera Deaths during January, February, and March 1891, in the Town and Suburbs with the corresponding Mean for Five Years :—*

Week ending Month and Date.	No. of Cholera Deaths.	Mean for past Five Years.	Week ending Month and Date.	No. of Cholera Deaths.	Mean for past Five Years.
Town—			Suburbs—		
From 1st to 3rd January 1891	10	10	From 1st to 3rd January 1891	9	11
January 1891, 10th	20	26	January 1891, 10th	22	21
Do. 17th	30	25	Do. 17th	24	27
Do. 24th	35	29	Do. 24th	24	24
Do. 31st	42	30	Do. 31st	44	29
February 1891, 7th	56	40	February 1891, 7th	68	23
Do. 14th	183	33	Do. 14th	355	26
Do. 21st	192	25	Do. 21st	149	25
Do. 28th	92	38	Do. 28th	52	37
March 1891, 7th	50	36	March 1891, 7th	41	34
Do. 14th	27	40	Do. 14th	38	30
Do. 21st	39	39	Do. 21st	62	39
Do. 28th	27	38	Do. 28th	29	36
From 29th to 31st March 1891	11	19	From 29th to 31st March 1891	11	18

The above table shows a total for the town of 137 cholera deaths in January, 523 in February, and 154 in March; and for the amalgamated area, 123 in January, 624 in February, and 181 in March. The subjoined statement gives the number of cholera deaths among residents and pilgrims or strangers in town and suburbs during January, February, and March :—

	Town.		Suburbs.	
	R.	P.	R.	P.
Total deaths in January	137=131	+ 6	123= 99	+ 24
Do. February	523=258 42†	+223	624=284	+340
Do. March	154=138	+ 16	181=166	+ 15

From a not unusual number of deaths in January the mortality of the town of Calcutta ran up to 523 deaths in February, which is the highest number in that month since 1866, and more than half the total mortality from cholera in Calcutta during the past year. A similar increase took place in the suburbs, the greater portion of the mortality being in the districts near Kalighat. By the end of March the mortality had again become low. Now, this outbreak and its behaviour is contrary to the ordinary seasonal bearing which characterises the prevalence of cholera in Calcutta, which increases in March, and generally rises to its maximum in April. Moreover, the epidemic, preceded as it had been by two years of very low mortality from cholera consequent on the introduction of a better water supply, consisted of a sudden and severe outbreak, followed by a return to the former low mortality. In the town, of the 523 deaths from cholera in February, 223 were pilgrims and 42 strangers. If we only consider up to the 15th February inclusive, even a larger proportion are pilgrims, for out of 260 deaths, 160 were pilgrims. In the suburbs the proportion is even higher, for out of 640 deaths, 340 were pilgrims.

Apart from the Ardhodaya Jog there appears to have been a slight increase in the cholera death-rate in the town proper and a slight decrease in the suburbs.

* Town of Calcutta refers to the town as understood before part of the suburbs was amalgamated with it. Suburbs refers to that portion of the suburbs which was amalgamated with the town.

† 42 strangers, not known whether pilgrims or not.

It may be remarked that notwithstanding the abundant supply of water brought into the town and pumped from the several reservoirs, many of the inhabitants still depend for much of their supply on wells, the water of which is very much polluted. It may seem paradoxical to state that there is scarcity of water in the town; yet this is actually the case, owing to the extraordinary waste that goes on in nearly every house in which water pipes have been laid. The effect of the increased public supply has been to increase the waste in those houses previously plentifully provided for, and to extend to a few other houses a supply which they were formerly without, and here also an immense waste is a matter of every-day observation. An additional number of standposts has been also added to the streets, but the scarcity is felt chiefly inside the bustees where the majority of the inhabitants are in much the same position as before the extension of the supply. They are only able to obtain water from the standposts at a distance. They, therefore, either store a supply in vessels subject to contamination, or resort to their wells and tanks. The labouring classes who are most affected with cholera go to their work before the supply can be obtained from the pipes, and they return to their homes after that supply has been stopped. The benefit they derive from the increased water-supply is, accordingly, small; and until a better system shall be introduced by which waste shall be prevented and the inhabitants shall be provided with a public supply of water, such as satisfies the inhabitants of an English town, the fluctuation from year to year of the cholera death-rate varying with seasonal influence is likely, other things being the same, to be not much different from what it is at the present time. A constant system, if it were possible to obtain it, would be the best; but in the event of this being impracticable on account of the necessary pumping, there should certainly be a supply throughout the whole of the day and of a kind to meet the requirements of the working people. The dangers of an intermittent system, such as Calcutta possesses, are sufficiently known to need no comment.

Bowel complaints.

There was an increase in the deaths from dysentery and diarrhœa; the deaths amounted to 1,433, against 1,311 in 1890, and 1,327 the mean number of the past 10 years.

Fevers.

The number of deaths registered as due to fevers amounted to 4,675 against 4,154 in 1890. Last year attention was drawn to the fact that fevers were 626 above the mean number of the decade. That increase has again progressed, and the deaths from fevers in urban Calcutta have now reached 1,111 above the mean of the past 10 years. In reporting on the cause last year, I stated that the report of Mr. Baldwin Latham on the drainage of Calcutta sufficiently explained the major causes at work inducing this unhealthiness, and that Mr. Baldwin Latham had conclusively shown that the Calcutta sewers, when flooded, leak and pollute the soil and subsoil water, which conditions are known to be very important factors in the causation, not only of fevers, but of a number of diseases included under the general head of "Other Causes"; and that the sooner the defects pointed out in the sewerage system were remedied, the more speedy would be the reduction of the death-rate so far as it depended on this cause. This view of the causation of ill-health was believed to be novel, though it is an elementary fact in the science of preventive medicine, that given pollution of the soil and favourable seasonal conditions, fever is sure to be engendered. That the sewers are in an unsatisfactory condition needs no expert in drainage engineering to determine. Anyone driving through the streets of Calcutta and over the open manholes will be soon made aware of the presence of sewer gas of a most offensive character, which becomes more than ever noticeable in the crowded quarters of the town. That a number of the sewers leak has been proved by uncovering them for inspection; that the soil is polluted has been determined by analysis; that the subsoil water is contaminated has been ascertained by the analysis of the water of wells, so that there is no escape from the conclusion as to the unsatisfactory state of the sewers. Both by inspection and by certain well-known calculations used by sanitary engineers, Mr. Baldwin Latham satisfied himself that the drainage system was in a most insanitary condition, polluting to a considerable extent both the soil and the atmosphere. With this opinion, I, as Health Officer, most thoroughly agree, for my experience, founded on personal observations as to the condition of the drainage system in many portions of the town fully corroborates Mr. Baldwin Latham's statements. The above-named sanitary engineer's report is accompanied by recommendations as to the adoption of certain remedies, and it would be well if his suggestions were adopted. The engagement of Mr. Baldwin Latham to overhaul the drainage system of the town was, next to the introduction of the water-supply to the

suburbs and the opening up of the Harrison Road, the most important sanitary measure undertaken during the year. That general seasonal causes favourable to the prevalence of fever have been at work during the past year may be admitted, but there are local conditions upon which these causes have found ample material to work. For urban Calcutta the defective drainage system and the tanks filled up with garbage still in a state of decomposition add their pollutions to the soil and form a breeding place for fever. For suburban Calcutta the want of a drainage system, the recent excavations at the docks, with their exposure of virgin soil and the absence of provision for the effective drainage of the raised land, and, generally, the proximity of the Salt Lakes, are reasons why fever and general ill-health should prevail. The importance of these local conditions as manufactories of disease is in no way lessened by the citation of statistics as to similar fevers having prevailed in other parts of Bengal.

Other Causes.

The deaths from other causes than those included under the distinctive heads of cholera, bowel-complaints, fevers, and small-pox amounted to 5,359, against a decennial mean of 5,344.

Vital Statistics of Suburban Calcutta.

There were in suburban Calcutta 4,221 births in 1891, giving a birth-rate of 19·6, against 3,970 in 1890, equal to a birth-rate of 18·4. The birth-rate has gradually improved during the past three years, the ratios being 16·5, 18·4, and 19·6.

There were 8,484 deaths, giving a death-rate of 39·4 per 1,000 of the population, against 7,986, equal to a ratio of 37·0 in 1890. The districts of Ballygunge and Kidderpore presented the highest death-rates, both being over the annual rate of 43 per 1,000. The annual death-rate from fevers at Kidderpore was equal to 17·2 per 1,000 of the population,

The number of deaths from the principal causes during the past two years were—

—	1891.	1890.	1889.
Bowel complaints -	1,283	1,448	1,425
Cholera - -	1,403	916	1,236
Small-pox - -	5	172	28
Fevers - -	3,176	2,638	2,653
Other causes - -	2,531	2,812	2,540

The following comparative statement shows the total number of births and deaths, and the birth and death rates per 1,000 of population in urban, suburban, and total municipal Calcutta during the year 1891 :—

—	Urban Calcutta.		Suburban Calcutta.		Total Municipal Calcutta.	
	Number.	Ratio.	Number.	Ratio.	Number.	Ratio.
Births -	8,256	17·6	4,221	19·6	12,477	18·3
Deaths -	13,033	27·9	8,484	39·4	21,517	31·5

Vaccination.

The total number vaccinated during the year 1891 amounted to 13,781 ; of these 10,875 were primary, and 2,906 were re-vaccinations. The corresponding figures of the previous year were 16,131 and 11,043 respectively. This shows a decrease of 5,256 primary and 8,137 re-vaccinations. The cause of decrease was the great prevalence of small-pox during the first five months of the previous year, when children up to a very tender age were vaccinated, and many elderly people who had been vaccinated or inoculated in their infancy resorted to re-vaccination. The increase of the previous year was also partly due to the vaccination and re-vaccination of many persons who came to our stations to be vaccinated from parts around Calcutta during the prevalence of the epidemic.

Of the primary vaccinations, viz., 10,875, 9,291 were successful, 711 unsuccessful, and in 893 cases the result was not ascertained. The rate of success in primary vaccination calculated on the ascertained successful cases was 92·87. Of the 2,906 re-vaccinations, 728 were successful, 1,937 unsuccessful, and in 241 cases the result was not ascertained. The rate of success in re-vaccinations was 27·31. The rates of success in primary and re-vaccination during the previous year were 88·00 and 20·39, respectively.

Of the total number vaccinated, 7,966 were males, 5,785 were females: 514 were Christians, 9,888 were Hindoos, 3,309 were Mahomedans, 70 were other castes; 5,224 were under one year, 5,283 were one year and under six years, and 3,274 above six years.

In Calcutta both the human and animal virus was kept up by regular transmission, and used all the year round. All the public vaccinators of the town and amalgamated area were supplied with vaccinated calves throughout the year, so that people had the option to be vaccinated with whichever lymph they preferred. The intelligent classes generally preferred the animal virus, and hence almost all home vaccinations were performed with it.

Vaccination is carried on in Calcutta under the provisions of the Compulsory Vaccination Act, the details of which having been reported in previous years, it is not necessary to repeat them here. The registrars submitted to the Health Officer by monthly statements the names of 9,883 persons who failed to produce the statutory certificates of having had their children vaccinated. These cases were inquired into by the department, with the result that 5,765 were traced and vaccinated, 1,505 were found to have left Calcutta, 693 were not found at the addresses given, 768 had died, 932 were ill, 11 had natural small-pox, and 209 were prosecuted and vaccinated by order of magistrates.

Under the powers conferred on the vaccinators by the amended Act, house-to-house inquiry for unprotected children, and also for elderly females in the Hindoo and Mahomedan zenanas was daily made by the male and female vaccinators of the town and added area, and where unprotected persons above one year were found, notices were issued to have them vaccinated. In this way 700 notices were served during the year. Most of the persons served with notice complied with the law, but 184 had to be prosecuted.

Small-pox.

The year under report was a non-epidemic year. The few isolated cases which occurred in the different parts of Calcutta were mostly imported, and owing to the early adoption of precautionary measures the disease did not tend to spread. From September to December Calcutta was entirely free from small-pox.

During the year under report the following ships arrived at the port with small-pox cases on board; on the 13th June *S.S. Umballa*, with a case of small-pox, and on the 21st August *S.S. Bhira*, with three cases of small-pox, of which one died.

Whenever the disease occurred vaccination and re-vaccination were pushed on with vigour. Most of the cases were removed to hospital, and their bedding and clothing destroyed, and the rooms in which they live were disinfected under the personal supervision of the medical inspectors. These precautionary measures helped to keep the disease under control, and prevented it from spreading.

Incineration of refuse.—The burning of refuse still further occupied the attention of the Commissioners during the past year, the result being that an incinerator, with arrangements for passing all vapours formed during the process of combustion through a cremator, is being now erected in the suburbs, and is approaching completion. Before this step was taken the subjoined report on the subject was presented to the Commissioners.

"My last report on the incineration of refuse showed that the Calcutta refuse could be burnt at all times, even during the period of the heaviest rains, and that therefore the contention that the refuse would not burn under such adverse circumstances had been proved to be fallacious.

"The difficulty, however, which was encountered in consequence of the smoke and offensive smells issuing from the chimney, considerably marred the value of the success, and made it evident that if this smoke nuisance could not be overcome, incineration, if adopted, must be carried on outside the town. Pending the solution of this further problem, I thought it desirable to suggest that the incinerator in Circular Road should be stopped, and it was with the special object of ascertaining how this smoke nuisance could be best done away with that, while in England I availed

myself of the opportunity afforded of visiting a number of towns where refuse destructors were at work.

"For this purpose I visited the refuse disposal works at Glasgow, Liverpool, Warrington, Manchester, Leeds, Bradford, Nottingham, Birmingham, London, Ealing and Hastings, and at every place enjoyed, through the courtesy of the authorities, the utmost facilities for studying the whole question, and having explained to me the working of the refuse destructors there.

"I found that those towns in England which had adopted incinerators had passed through a similar experience to that which we have done in Calcutta. First of all they had some difficulty in burning the refuse, and when they had succeeded in this, there were numerous complaints as to the smells proceeding from the chimney, so that some Corporations were threatened with law proceedings to compel them to shut the works. The Corporations, however, persevered, and with the hope of abating the nuisance, made vigorous efforts to improve the combustion in the furnaces by modifications in the form of the furnaces and poisition of the flues, then by the adoption of the air-blasts and steam-blasts.

"With the details of the steam-blasts as applied to incinerators the Calcutta Commissioners are familiar, having an example in Messrs. Garlick's incinerators. There the heated gases escaping from the furnaces to the chimney pass on their way through a multitubular boiler which generates the steam that is conveyed by pipes to the hearth of the furnaces, and supplies the blast. The air-blast has steam generated in the same manner, and this is utilised to work an engine which turns a fan which supplies air in great force to the furnace-fires.

"Both air-blast and steam-blast undoubtedly improve the combustion in the furnaces, but neither has proved effectual in totally destroying the empyreumatic vapours escaping, though there can be no doubt as to their usefulness in raising the heat of the furnaces, and consequently burning the refuse more expeditiously. In the majority of instances they are used merely as auxiliaries, the natural draft of the chimney being employed when from any cause the blast is not working.

"Other means had therefore to be devised by which the unburnt and offensive vapours should be completely destroyed before leaving the chimney, and experience has shown that these vapours must be dealt with separately after leaving the furnaces, and before entering the chimney. In fact the same conclusion was arrived at as was come to in Calcutta, viz., that the only proper manner of dealing with the offensive gases and vapours was to burn them in a special furnace or cremator.

"This plan has been adopted and has succeeded admirably, so that there are no longer complaints against the destructors, and they are being erected in central quarters of the different towns without fear of creating a nuisance. I saw a destructor in Bradford which has been recently erected, that bordered upon one of the principal roads quite close to inhabited houses; another destructor, recently erected in Liverpool, is in a central part of the town. That at Ealing struck me as furnishing the most crucial test of the efficiency of the burning process, and of its freedom from nuisance. Ealing is a residential suburb situated about 10 miles from London. The sewage of the town has to be purified before being discharged into the river. Part of the purification is accomplished by precipitating the sewage with chemicals in tanks. The solids fall to the bottom of the tank in the form of sewage sludge. This sewage sludge is periodically removed and mixed with house refuse, put into the destructors and burnt. If anything can produce an abominable smell from a chimney, this would, yet the vapours here are so completely burnt after leaving the furnaces, and before entering the chimney, that there is absolutely no smell. Houses have been built within 100 yards of the works. The locality is an undulating one, and it so happens that the top of the chimney is on a level with the first floor windows of Baron X-'s residence, which is less than half a mile away. If there was the slightest nuisance from the chimney, there can be no doubt, with such a powerful opponent close by, the destructor would not be tolerated.

"For burning the vapours before they enter the chimney several kinds of cremators are used. In Birmingham they use one kind, in Manchester another; while in most of the towns Jones' Fume Cremator is used. It does not matter much what kind of cremator is used as long as it accomplishes its object, viz., the breaking up of the offensive vapours into simple inoffensive elements, and that is obtained by keeping the creator at a continuous heat of over 1,000 degrees.

* * * * * *

"Previous to my visit to Europe I was under the impression that poudrette works might be suitable for suburban Calcutta, but after having seen the immense works in

Paris, and also those of Birmingham, Manchester, and Warrington, I am convinced that these works are not only too costly and too complicated for Calcutta, but that the high prices given by the farmers for this kind of manure in England and France could not be obtained here, and it is doubtful whether there would be much of a demand for its supply. Possibly a few tea planters would be glad of the poudrette, and the sale after a time would possibly increase, but the loss at first would be great, and it is questionable whether it could be ever worked but with a loss.

" I met at the International Hygienic Congress the constructor of the poudrette works at Bondy, in Paris, and had a conversation with him on the subject. One would have thought he would have been in favour of his own works, but over 20 years' experience had not given him a favourable impression. The Bondy works cost nearly 300,000*l.*, and they are not the only ones in Paris. The products from the excreta and urine are sulphate of ammonia and poudrette.

" I think, therefore, that this question of poudrette works for Calcutta may be dismissed as being an unsuitable mode of disposing of the sewage of suburban Calcutta, and with this definitely settled, the Commissioners are able to proceed with Mr. Baldwin Latham's scheme of a low level sluice outfall with much more confidence.

" As to the refuse, there can be no doubt that burning is the best mode of disposal. Mr. Harrington's furnaces differ somewhat from those which give the best results in England, but the refuse here is bulky and of a different kind, and the furnaces here have had to be adapted to the altered conditions. Of the burning capacity of the furnaces there is ample evidence, and as I have stated, the smoke can be burnt, and has to be burnt, in a separate cremator, and may also be washed before leaving the chimney. Mr. Harrington makes an offer to build incinerators with these improvements, and I would recommend its acceptance with the proviso that if his cremators are not a complete success, he should put in at his own expense to each incinerator two of Jones' Fume Cremators patented in England."

Sanitary improvement.—Much has been done in the year in demolishing unhealthy areas, especially in connexion with the construction of the new Harrison Road in the heart of the Northern portion of the town, which has cleared away some very congested and unhealthy localities. Similarly the erection of the new water-works at Bhowanipore has been accompanied by the clearance of a large tract of bustee land which was always remarkable for its filth and as a centre for the diffusion of disease to the surrounding neighbourhood. In this case the substitution of good roads, open spaces, and building plots has materially improved the healthiness of the surrounding houses. The construction of the Lansdowne Road has also been the means of clearing away many unhealthy spots, removing a number of unhealthy tanks, improving others, and opening up a wide street from north to south which will act as an excellent ventilator to that part of the town. These measures have conduced to healthiness and constitute good work in the cause of public health ; but it is necessary to mention in connexion with these improvements what I have mentioned in almost every report I have written on the health of Calcutta, that to grapple with the problem of rendering Calcutta a healthy city, a system or scheme very different from this is needed. Demolition and clearances are necessary, and a vast amount remains to be done in this direction, especially in the riparian and some other wards; but if any permanent good is to be effected, the demolition of unhealthy areas must be accompanied and supported by that which in the long run is a much more powerful factor in making a city healthy, viz., a good Building Act, which shall provide that streets shall be laid out sufficiently broad and regular, and shall render compulsory the erection of buildings and houses on a healthy plan and system. It is only by this means that the sanitary appliances of drainage can be effective. To attempt to sanitate some of the crowded localities of Calcutta must, by the nature of the circumstances, end in failure. The crowding together of houses under the present rules and the erection of badly ventilated houses can only end in foul passages, the formation of unwholesome narrow lanes, faulty and offensive drainage, and impurity of the air. There is a very intimate connexion between the building laws of a city and the benefits which will accrue from sanitary measures and from drainage. For in a thickly-populated unhealthy area the very necessities of the inhabitants are such that every place is filthy notwithstanding much cleansing, and the drains are always out of order, giving forth offensive effluvia which no ingenuity or methods in sanitary science can rectify.

ABSTRACT OF REPORT OF THE MADRAS MUNICIPALITY FOR 1891–92.

(*Lieutenant-Colonel G. M. J. Moore, President.*)

Roads.—Under the head of improvement to streets considerable progress has been made, the drainage of Annah Pillay Street is practically complete, a few minor works such as cesspools and silt traps alone remain to be done. The completion of these works depends on the acquisition of some more properties.

Black Town Drainage—Silt Traps. 20 silt traps have been constructed in connexion with No. 2 sewer. This sewer was opened in August 1891, and the farms at Wall Tax Road and Teroopally Street were closed.

Surface Drains.—The amount of work done in connexion with the surface drains during the year was 2,762 ft., bringing the total up to 231,217 ft.

House Drainage.—During the year Rs. 489–15–2 was the amount paid to contractors for work done to house drains where the owners failed to comply with the notices, and Rs. 630–0–7 was the amount recovered from the owners, including arrears. The number of house drains altered and repaired by the municipality during the year was 2, and by owners 5. This makes a total up to date of 8,670 house drains altered and repaired since the drainage works began.

Water-Supply.—In connexion with the new water-supply no further action has been taken, pending the report of Mr. E. Cousins, who was appointed by Government and sent out from England to report on this subject as well as on the drainage of Madras. Every assistance was given to Mr. Cousins to enable him to understand the existing arrangements. The delivery channel has been surveyed and demarcated by the Revenue Survey Department, and a plan is in preparation.

Owing to the rapid increase of new services during the last few years, it was found that the supply at public fountains was becoming defective, and it was decided to stop all further connexions to private properties.

During the year under report, 2,727 yards of pipes were laid, and 38 fountains, 16 valves, 129 stop-cocks, and 9 flushing pipes were fixed within the municipal limits.

On the 1st April 1891, the level of the Red Hills Lake stood at 37·87, and at 37·39 on the 31st March 1892. On the 10th June 1891, the level of the lake at Red Hills fell to 35·47, and pumping was commenced and was continued till 26th October 1891.

The quantity of water supplied to the city during 1891–92 was 327,888,049 cubic feet, as compared with 334,579,842 cubic feet in 1890–91.

The water taken (1) from Red Hills Lake, (2) from the Delivery Channel at Kilpauk, and (3) from the pipes at three places within the town was, on chemical examination, proved to be bad in every case.

Conservancy.

No change has been made in the system. The scavengers are employed and paid departmentally, and the carts, bullocks, and drivers are supplied by one and the same contractor. This has worked fairly satisfactorily, and the scavenging has been carried out as efficiently as could be expected, considering the smallness of the establishment for the area to be conserved. It is in contemplation for the municipality to purchase the carts, and hire only the bullocks and drivers at the close of the present contract, by which a considerable saving might be effected.

Vaccination.

The total number of persons vaccinated during the year 1891–92 was 26,493, against 24,768 in 1890–91, showing an increase of 1,725 cases in spite of the prevalence of cholera, which always deters people from bringing their children to the depôts. Out of the 26,493 cases, 25,004 were successful, 583 unsuccessful, and 906 unknown. The unsuccessful and unknown results exceed those of the last year by 268 and 538 respectively. They were mostly among the convicts vaccinated in the Penitentiary and transferred to other jails after operation, or released after the expiry of a short term of imprisonment. Out of 26,493 cases vaccinated within the city of Madras

25,102 were operated on by the municipal vaccinators directly from the calf, and the operation in 1,391 cases, from April to October 1891, was done by the medical subordinates attached to the Penitentiary with Lanoline paste supplied to them from Dr. King's Vaccine Depôt. Of the 1,391 cases, 697 were reported as successful, 115 as unsuccessful, and 579 as unknown.

From November 1891 inoculated calves were sent to the Penitentiary, along with municipal vaccinators, to vaccinate the convicts at the request of the Superintendent of Prisons for the town of Madras, in consequence of the abolition of the Government Vaccine Depôt under Dr. W. G. King.

The following is a comparative statement of the results of 1890–91 and 1891–92. The increase in the number of vaccine operations was mainly due to the vaccination of the Natal emigrant coolies, who resorted to the Monegar Choultry Depôt, and to the fishermen of the Cassimode and Thondiarpet Coopams, &c., sending their children to be vaccinated at the public depôts.

Year.	Total vaccinated.	Compared with the preceding Year.		Successfully vaccinated.	Percentage of success, excluding unknown.
		Increase.	Decrease.		
1890–91 - -	24,768	—	—	24,085	98·70
1891–92 - -	26,493	1,725	—	25,004	97·72

The percentage of successful cases, excluding the unknown from the total, was 97·72 as against 98·70, showing a decrease of 0·98, which is due to the inclusion of 1,391 cases vaccinated among the convicts of Her Majesty's Penitentiary with lanoline paste, from April to October 1891, by the medical subordinates. There has been an increase in the unsuccessful and unknown results over that of 1890–91 by 268 and 538 respectively, for the returns received from the medical officer in charge of the Penitentiary show that out of 1,391 cases operated on with lanoline paste, 697 were successful, 115 unsuccessful, and 579 unknown. The lower percentage of successful cases is also partly due to the Monegar Choultry Depôt, which is by far the largest in the municipality returning a much larger number of unsuccessful cases than it did last year.

Out of 26,493 cases vaccinated, 14,765 were males, and 11,728 females; 1,068 were Europeans, East Indians, and Native Christians, 1,619 Mahomedans, and 23,806 Hindus. Out of the total cases, 22,451 were primary, and 4,042 re-vaccinations. Out of 22,451 primary vaccinations 22,165, or a percentage of 99·45, were successful, as against 99·29 in 1890–91.

The number of infantile vaccinations performed during the year was 15,903, as against 15,709 in 1890–91, showing a slight increase of 194 cases. Of these 15,798, or 99·82 per cent. were successful. The following statement will show that during the past three years the largest number of cases vaccinated was among children under 1 year. Out of 26,493 cases vaccinated in 1891–92, 15,903 were infants under 1 year of age, 4,682 above 1 and under 6 years, and 5,908 above 6 years:—

	Total Number Vaccinated.			Ratio.		
	1889–90.	1890–91.	1891–92.	1889–90.	1890–91.	1891–92.
Under one year - - -	15,620	15,709	15,903	63·7	63·4	60·0
Above one and under six years -	5,434	5,252	4,682	22·2	21·2	17·7
Above six years - - -	3,448	3,807	5,908	14·1	15·4	22·3
Total - - -	24,502	24,768	26,493	100·0	100·0	100·0

The number of births registered during the year 1891–92 was 18,798. Of these 462 were still-born and 18,336 were born alive. There were 6,676 deaths under one year from various causes, exclusive of the still-born cases. Deducting these from the total births registered, it will be seen that the number of infants vaccinated exceeds the number of live children of one year of age. If an allowance is made for the number of children that died under one year of age, but were vaccinated before their death, the numbers are about balanced.

For every 100 of the population 6·64 were vaccinated during the year. The proportion of Hindus is especially large. In the year 1891–92, 7·67 per cent. of that class resorted to vaccination, against 2·73 among Europeans, East Indians, and Native Christians, and 3·28 among Mahomedans.

During the year, 24 deaths from small-pox occurred against 92 in the previous year, showing a large decline in the mortality. Of the 24 deaths, three occurred in hospitals and dispensaries, and the remaining 21 in private houses in the city. The disease is frequently imported to Madras from the adjacent districts. Attempts are constantly being made to stamp out the disease, but fresh cases occur in some other division, and from inquiries made there is no doubt that a very large proportion of the cases that end fatally occur among unprotected people who come up to Madras after contracting the disease up-country, and as small-pox has a long period of incubation, the outward manifestations develop after their arrival in the town.

The disease was not confined to any particular local area but scattered over the town. Some cases occurred among the unprotected under six months, postponed cases above six months and unprotected people of various ages. Immediate steps were always taken in vaccinating the unprotected in the neighbourhood where cases of deaths from small-pox occurred, and the houses were also disinfected.

Vital statistics.

Births.—During the year 1891 the total number of births registered was 18,061, exclusive of stillborn, which is more than the preceding year by 492, and is the highest number in the decennium, though the birth-rate of 39·9 is considerably lower than that of last year, 44 per 1,000, as it is calculated on the census of 1891, and no allowance has been made for the gradual increase of the population during the decennium since the former census. Of these births, 9,377 were males and 8,684 females. The number of still-births was 489 against 533 in the previous year, being 274 males and 215 females. This figure is above the decennial average of 413·9.

The Hindus were again the most prolific race in Madras, with a ratio of 40·4 per 1,000, the Mahomedans second with 38·9, and the Europeans, East Indians, and Native Christians last with 37·3, which shows some improvement on their last year's ratio.

Mortality.—The total number of deaths during the year was 23,808 against 17,194 the year before, giving a ratio of 52·6 per 1,000. The comparative death-rates of the different castes were Mahomedans 59·6, Hindus 52·5, and Christians 44. An inquiry into the causes of this high mortality, which is about 17 per 1,000 above the average for the last 10 years, shows that there were certain more or less exceptional causes, viz., the high price of food, which largely predisposes to disease, more especially in a poor population, and the fact that at least two epidemics, fever and cholera, were rife in the city and prevailed amongst the masses, whose resisting powers were lowered through the indifferent quality and insufficiency of their food. The regular labourer in Madras gets about Rs. 6 a month, and the casual labourer about As. 3 or 4 a day. Out of this, in many cases, a number of children have to be provided with the necessaries of life.

The epidemics can only be held to be a proximate cause of the high mortality, for it is now generally recognised that the epidemic susceptibility of a city is in inverse proportion to its sanitary condition. Moreover, if the deaths from this cause were eliminated from the total, the remainder would still be abnormally high for a city in which sanitation has been in progress for a quarter of a century. The great difficulty in dealing with the problem of Madras sanitation lies in the fact that the high death-rate is not the result of any one cause, but of a conjunction of nearly all the causes that affect mortality all over the world. To enumerate them as shortly as possible, the more important ones are an indifferent water-supply, defective drainage, and over a considerable portion of the municipality no drainage at all, a porous soil loaded with organic impurity, a putrid and fluctuating sub-soil water rising comparatively near the surface, want of open spaces in some parts of the town, crowded parcherries for the poor, overcrowded and ill-ventilated houses for the middle class, in many cases directly connected with the sub-soil water by wells in their interior, burial grounds and slaughter-houses in the city; and lastly, the general social, conjugal and religious habits and customs of the people. These are matters which can only be remedied by a heavy expenditure of money and years of systematic and patient work. There can be no doubt that the high death-rate is due to local conditions and not to climatic influence, for the people, European and Native, who live in well-built houses in the better parts of the town, and are properly clothed and fed, enjoy a comparative immunity from disease and death.

Mortality from different Diseases.—A comparison of the relative mortality from different diseases in 1890 and 1891 shows that the number of deaths registered under small-pox and measles was lower, and the number under fevers, diarrhœa, and dysentery, cholera, and "other causes" was higher during the year under review than in the previous year:—

Statement of Mortality from the Prevalent Diseases in 1891 *contrasted with that of* 1890.

Years.	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Total.	Other Causes.	General Total.	Ratio per 1,000.
1890 - -	78	412	4,685	2,704	744	8,623	8,571	17,194	37·9
1891 - -	66	372	6,731	4,573	1,916	13,658	10,150	23,808	52·6
Average of 10 previous years.	822·9	277·3	3,828·7	2,546·2	413·6	7,889·7	8,229·9	16,119·6	40·6*

* Calculated on the census population of 1881.

The following table shows the mortality of the year, classified according to age:—

Age.	Population.	Deaths.		Total.	Ratio per 1,000.
		Males.	Females.		
0–	13,667	3,178	2,665	5,843	427·5
1–4	41,016	1,799	1,917	3,716	90·5
5–9	52,611	656	717	1,373	26·0
10–14	43,804	363	465	828	18·9
15–19	39,288	301	450	751	19·1
20–29	87,366	892	1,355	3,247	25·7
30–39	67,462	864	981	1,845	27·3
40–49	48,904	782	731	1,513	30·9
50–59	30,039	707	639	1,346	44·8
60 and upwards	28,361	1,958	2,388	4,346	153·2

The noticeable feature of this table is the abnormally high infantile mortality, the sure sign of defective sanitation. The deaths under one year of age, excluding still-births, were 5,843, against 5,829 in the previous year, giving a ratio of 427·5 per 1,000 of infants under one year—or 30·19 per cent. of the children born alive died before completing their first year. The excessive infantile mortality of Madras is forming the subject of an inquiry by the Sanitary Commissioner.

The infantile mortality under 1 year and of 1 and under 5 years is localised according to Divisions in Appendix VI, Table 2. It is shown that the highest rate of mortality for the first period was in the 1st Division, viz., 559·4 per 1,000 infants, and the second highest in the 2nd Division, viz., 534·2; and that for the second period the 1st Division had the highest ratio of mortality, viz., 135·9, and the 3rd and 4th Divisions are nearly equal for the second place with 96·6 and 96·7 per 1,000 respectively.

According to sex 11,500 males and 12,308 females died during the year, against 8,514 males and 8,680 females in the previous year. The fact that the male European deaths outnumbered the female is attributable to the fact that there are considerably more male than female Europeans in Madras.

Small-pox.—The number of deaths from small-pox was 66, or 0·1 per 1,000 of the population. A considerable number of the cases were imported during the stage of incubation. It is worth noting that the mortality from this cause among Mahomedans, who offer the greatest opposition to vaccination, was four times as heavy as that among any other class.

Cholera.—This disease was epidemic in Madras during the latter part of the year, the total mortality being 1,916 and the ratio 4·2 per 1,000.

Measles.—The mortality from this disease has diminished since the epidemic occurred in 1889 causing 1,204 deaths. In 1890, 412 deaths occurred. In the year

under review the number was 372. During this year the mortality decreased quarter by quarter, the numbers being 118, 108, 82 and 64.

Fevers.—The mortality under this head amounted to 6,731 against 4,685 in the previous year, giving a ratio of 14·8 deaths per 1,000 of the population. There is no doubt that some form of fever was epidemic in Madras during the latter part of the year, and from inquiries made by some of the Registrars into all the cases of fever that were registered in their offices during a certain period, it is believed that it was influenza, which was almost pandemic over the globe, but the evidence was far from satisfactory. It is a matter of the greatest difficulty to diagnose a non-eruptive fever among people who rarely attend a hospital or avail themselves of the ministrations of a qualified medical attendant of any grade, and who for the most part die in their parcherries without being seen by any one but their relatives. Even house-to-house visitation is of very little use, for an obscure fever cannot be diagnosed without a temperature chart and an accurate record of signs and symptoms extending over at least two days. Apart from this the ordinary type of Madras fever was probably more fatal than usual. Amongst the Mahomedans the death-rate from fevers reached the extraordinarily high figure of 18·5, which is as much as the death-rate from all causes in a fairly healthy city. Amongst the Hindus it was 14·8 and among the Europeans, East Indians, and Native Christians 10·5.

Bowel Complaints.—The mortality from dysentery and diarrhœa was 2,996 and 1,577 respectively, with ratios of 6·6 and 3·4 per 1,000, against 1,682 and 1,022, with ratios of 4·2 and 2·5 in the previous year. A high mortality from these complaints is a usual accompaniment to an epidemic of cholera, but at the same time it is probable that a considerable number of deaths from the latter cause were registered under these heads through ignorance, or to prevent alarm amongst relatives, or to avoid municipal visitations. When the cases have not been seen during the illness by a medical man, it is hopeless to expect to prove in a court of law that the cases have been falsely registered, however suspicious the circumstances may be.

ABSTRACT OF REPORT OF THE MUNICIPAL COMMISSIONER FOR THE CITY OF BOMBAY FOR 1891-92.

(*Mr. H. A. Acworth.*)

Public Works.

DRAINAGE.—*Pumping Station, Love Grove, Worli.*—The existing machinery at this station has been kept in as good working order as its character admits of, and no breakdown or accident of any serious nature occurred. The report of the Committee of the Corporation appointed to consider the efficiency or otherwise of the machinery was discussed by the Corporation on the 31st August 1891. The conclusion arrived at was that the existing machinery should be condemned and more modern and economical machinery substituted for it, and accordingly sanction was given to the expenditure of a sum of Rs. 4,00,000 for this purpose, viz., Rs. 3,38,259 for the purchase of 4 Worthington 15 million gallon pumps and steam engines, and the balance for the construction of the necessary masonry work. The new machinery should, under the contract entered into, be supplied and fixed during the current year. The lighting of the Pumping Station has been improved by the substitution of a new dynamo of the latest type for the old one.

House connexions in first drainage section.—No tenders for this work have been received, nothing further was done until the 4th January 1892, when the Corporation passed a resolution to the effect that efforts should be made to undertake the work as early as possible. Accordingly the work was proceeded with departmentally, and good progress has been made.

In the Queen's Road and Girgaum Drainage Section, the work in connexion with the pipe sewers and house connexions has, so far as the contractors were concerned, been finished. In the Agripada district fair progress has been made in the house connexion work, and it is anticipated that it will be completed within the contract time. The laying of a pipe sewer in Government House Road and Parel Village Main Road was sanctioned by the Corporation on the 14th January 1892, and at the close of the year a tender for the work had been accepted.

The Sanitary Commissioner having raised certain points regarding drainage and sewerage, a Committee of the Corporation conferred with him and discussed the following points:—(*a*) The question of concrete foundations for drains; (*b*) the question of the water-tight condition of pipe drains; (*c*) the saturation of the ground with subsoil water; and (*d*) the removal of silt from the drains.

The question of the location of an outfall at Colaba has been definitely settled in the negative. The Committee appointed by Government to discuss this question disapproved of the change of outfalls from Worli to Colaba. The Military authorities also objected to it, and Government finally decided that Worli should continue to be the place for the outfall of the drainage of Bombay.

Several new latrines and urinals have been erected, and several are in course of erection. The several drainage sluices were worked satisfactorily and the work in miscellaneous drainage, of repairing, altering, constructing, cleaning and flushing sewers and drains was well done.

WATERWORKS.—*Tansa.*—The Tansa Waterworks, as a whole, were opened in Chinchpoogly in Bombay by the Marquis of Lansdowne, Viceroy and Governor-General of India, on the 31st March 1892, and the regular supply of Tansa water to the city commenced from that day. These works were begun in January 1886, and have thus taken six years to complete. The cost has been nearly one crore and a half. The supply from Tansa will be 20 or 21 million gallons of water daily instead of, as originally estimated, 17 million gallons. The dam at Tansa, the last stone of which was laid on the 3rd April 1891, is nearly two miles long, and it is the largest masonry dam in the world. The area of the lake is nearly six square miles. A rainfall of 40 inches is sufficient to fill the lake, so that even in the driest season no apprehension need be felt as to the sufficiency of the water-supply. The duct, which from the dam at Tansa to Chinchpoogly in Bombay, is 54 miles and 2,407 feet, contains about 23 miles masonry conduit, 27 miles of iron main of 4 feet diameter, about 4 miles of tunnels, and something less than a mile of iron girder bridges.

The total quantity of masonry in the dam is 11,029,022 cubic feet. The crest of the waste weir is at R. L. 405·00. This level gives a depth of 115 feet against the water face of the dam in the bed of the river, and a depth of 25 feet from crest of waste weir to sills of the lowest outlet sluices. The rainfall for the year was 82·66 inches, but on the 30th July 1891, when the rainfall had amounted to only 45·06 inches, the lake filled, and water flowed over the waste weir. At the end of the year (31st March 1892) the water stood at R. L. 401·74 or 3·26 feet below the crest of the waste weir.

The duct from Tansa to Ghat Kopar was finished by 1st February 1892. The total length of this portion of the duct is 45 miles and 864 feet. A favourable site on the sixth mile has been secured, where, in view of future possible filtering requirements, filter-beds can be constructed. The loss of water in transit is slightly over 1 per cent.

The duct—an iron main of 4 feet diameter—was finished on the 28th December 1891, or nine weeks before the contract time.

Except for malarious fever, which was prevalent, there was no serious illness on the works.

Vehar.—The rainfall for the year was 89·87 inches, or about 10 per cent. above the average. The lowest level of the water was on the 27th June, viz., 247·60 on T.H.D. The lake was benefited from the 2nd September to the 3rd October by the overflow from Tulsi, the quantity received being estimated at about 400 millions of gallons. The lake did not overflow, but on the 1st October it was at 263·30, or within 0·20 feet of the overflow level.

Pawai.—The pumping plant worked very satisfactorily, and about 150 millions of gallons of water were pumped into the Vehar mains. The rainfall was 89·20 inches. The dispute regarding the value of the land acquired for the works has been settled by the District Judge of Thana, who upheld the Collector's award of Rs. 1,12,432-15-6 for the land, plus 15 per cent. for compulsory taking, plus 6 per cent. interest for trees. The result of this case strongly illustrates the necessity of amending the present Land Acquisition Act. Boundary stones have been fixed to demarcate the land. The Tansa Waterworks have been completed, the necessity for maintaining the Pawai works has ceased, and consequently the pumping machinery will be disposed of.

Tulsi.—The rainfall was 99·47 inches. The lake commenced to overflow on the 2nd September 1891, and continued so to do up to the 2nd October.

Bhundarwada (John Hay Grant) Reservoir.—Works to reduce the leakage of the reservoir have been continued with satisfactory results. The joints of the walls in filters Nos. 2 and 6 have been pointed with Indian patent stone, and the same material has been used in pointing the joints of the walls of the channels, and in covering both the floors and the tops of the walls. The walls of the distributing basin have been re-pointed inside. The result of the work done at the filters has been the reduction of the leakage from 116,550 gallons to 5,857 gallons per day, that is, 95 per cent. of the leakage has been stopped.

Malabar Hill Reservoir.—The whole of the inner surface of the outer walls has been re-pointed with Indian patent stone, and the leakage has been much reduced. The turbine for the supply of the high level districts has worked satisfactorily.

Attention was called in the Corporation to the presence of crocodiles in the Vehar and Tulsi lakes, and payment of rewards for their capture and for finding of their eggs was sanctioned, but up to the 31st March 1892 rewards have been claimed only for two crocodiles. Attention was also called to the alleged presence of leeches in the water supplied to the town, and strainers were fixed to the service mains.

Distribution and Maintenance.—The total length of new mains laid during the year was about 14,100 feet, and the renewal of old mains 2,391 feet. The principal work was the laying of a new 24″ main from Chaopati along the Queen's Road to the Fort, for an improved supply to the Fort, Esplanade, and Colaba. The 32″ Vehar main under the site selected for the new Byculla Railway Station was diverted without a hitch of any kind. The new line, 2,442 feet in length, is along the DeLisle Road, from Clerk Road to Haines Road, and thence along Haines Road to the railway fence. The number of free supplies, dipping wells, drinking fountains, &c., was at the close of the year 172. The number of notices issued to owners on account of faulty taps and service pipes, &c., was 3,192 as against 3,180 in the previous year. There were in all 108 bursts of pipes, of which 68 were of 3″ and 27 of 4″ pipes, 698 new connexions were made, and 219 services disconnected, the net increase being 479, thus bringing the total up to 18,113, or an increase for the year of 2·7 per cent. The meters in use at the end of the year were 1,319 as against 1,184 for the preceding year, or an increase of 135.

Public health.

The state of the public health during the year under review has been unfavourable. The total number of deaths from all causes amounted to 23,847, equal to a death-rate calculated upon a population of 821,764 (the census of 1891) of 29·01 per 1,000 of population. This is an increase of 3,313 in the number of the previous year. The average number of deaths for the last five years is 22,138, or a death-rate of 25·69.

The returns of mortality from the chief death causes show a decrease in small-pox and accidents, and an increase in cholera, measles, fevers, phthisis, nervous system, respiratory system, diarrhœa and dysentery.

The death-rate was highest amongst the Bhatias, Hindu low castes, Jains and Lingaets, being 40·42, 42·50, 42·73, and 47·19 per 1,000 of population respectively. It was lowest among the Europeans, Jews, Parsis, Native Christians, and Brahmins, being 18·60, 20·91, 23·28, 23·52, and 23·66 respectively. The sections of highest mortality were Kamathipura 44·41, Parel 43·21, 2nd Nagpada 42·41, Khara Talao 40·28, Omerkhari 38·57, and Chuckla 38·26, and the lowest, Fort (South) 3·79, Mahaluxmi 13·16, Sion 15·81, Chowpati 15·72, Worli 16, Esplanade 17·38, and Walkeshwar 17·85.

A most serious public nuisance and cause of injury to the health of some people was caused by damaged and fermenting cargo being landed in July 1891 from the S.S. "Knight Companion." A quantity of this cargo—damaged grain and seeds—was found in the City and on the Port Trust estate. In consequence of the measures adopted, quantities were removed to the suburbs, but the nuisance caused by the offensive odour arising from that which remained in the City was so great, that the owners were called upon to destroy it, and in cases of refusal they were prosecuted and fined. In two cases—of wheat—it was however held by the magistrate that, although unfit for food, it could be made use of for "sizing," and consequently the cases were dismissed. No guarantee was, however, taken by the Court that the wheat would be used for "sizing."

Cholera.—The number of deaths from cholera was 164, or 62 more than in the previous year. Except the Negro-Africans, the death-rate was highest amongst the Europeans, viz., 1·59 per 1,000. But the whole of the deaths of the Europeans, 18 in number, occurred between the 11th and 14th September on the ships of the Royal Navy the "Marathon" and the "Redbreast." As far as could be ascertained, this mortality had its origin *outside* Bombay, for in the week in which these deaths took place on board these vessels, only six deaths from cholera occurred in the whole Island. The sections of greatest mortality were: the Harbour, Mahim, Mazagon, and Girgaum.

Small-pox.—The deaths from small-pox were 108, or 42 less than last year; and these occurred chiefly amongst Hindus of other castes, and Mussalmans. The death-rate was greatest in the districts of Sewri and Parel.

Measles.—There were 614 deaths from measles, or 435 more than in the previous year. The highest mortality was, as in the preceding year, amongst "Hindu out-castes." The death-rate was greatest in the districts of Parel, Tardeo, Dongri, Sewri, and Byculla. In the Fort (South) and Esplanade, no deaths from measles occurred.

Fever.—The deaths from fever were 6,837, or 435 more than last year. The greatest mortality was amongst Jains, Hindu low castes, and Lingaets. The death-rate was highest in the districts of Sewri and Parel.

Leprosy.—There were 106 deaths from leprosy, or 61 more than last year, or 41 more than the average. The large number of deaths from this cause is owing to a more correct registration of deaths consequent on the establishment of, and collection of lepers in, the Leper home at Matunga. The condition of the lepers in Bombay has attracted considerable public attention.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF BOMBAY FOR 1891.

(*Dr. T. S. Weir.*)

We have had in this year again an abnormal season, accompanied by an unfavourable state of public health. Up to as late as the third week of June under 2 inches of rain had fallen at Colaba, and none as far north as Byculla. The late coming of the season of rainfall caused much apprehension.

The effects of these abnormal conditions have had to be combated with, but other conditions arising within and out of the city have had also to be contended against. We have had to contend not only against unwholesome conditions from without, but against unwholesome conditions from within. The result of our labours has been the saving of lives and prevention of sickness. We need not be disheartened because the growth of the population has been quicker than the construction of new drains and that fearful nuisances have come with new buildings.

The deaths by place of birth do not approximate so closely as in the last year, 12,218 were born in Bombay, and 11,418 elsewhere, being a difference of 800. The deaths amongst Bombay-born are higher than in the preceding five years, while the deaths amongst strangers are also higher than in the five years before. The incidence of mortality by months shows a favourable mortality in January and February and an enhancement in March. The enhancement was due to an increased number of deaths from fevers, measles, and diseases of the respiratory system. In the first two months of the year a greater number of deaths amongst strangers than Bombay-born and from the end of February to the end of August amongst Bombay-born is observed. In the last four months of the year the annual migration of population affected the incidence of the mortality by place of birth—more strangers that Bombay-born dying.

A most serious public nuisance and cause of injury to the health of some people was caused by damaged and fermenting cargo landed in July from a steamer, the S.S. "Knight Companion." The nuisance was the most general and the most offensive I have known.

Return showing the Number of Deaths from Different Causes in 1891.

Causes of Deaths.	Number of Deaths.	Rate per 1,000 of Population.	Remarks.
Small-pox	108	·13	These calculations are made on the population of 1891.
Measles	614	·75	
Fever	6,837	8·32	
Cholera	164	·20	
Phthisis	3,132	3·81	
Diseases of the Nervous System	2,447	2·98	
" Respiratory System	4,379	5·33	
Diarrhœa	1,029	1·25	
Dysentery	472	·57	
Accidents	364	·44	
All other causes except Still-born	4,301	5·23	
Total	23,847	29·01	

Chief Death Causes.—Analysing the mortality from the chief death causes, the results are an increase from measles, fevers, cholera, phthisis, diseases of the respiratory system, diseases of the nervous system and diarrhœa.

As in preceding years, the mortality of male children under 1 year (3,984) is higher than the mortality of female children (3,434), while from 1 to 4 years more females die. From 5–9 years more males died, but over 9 and up to 24 the female mortality is more than double the male. Over 24, although the female mortality is much greater it

declines at each period, until from 40–44 the male mortality is higher than the female. This high female mortality appears to be connected with early marriage and cares of womanhood. We have had the same results in all former years, whether on the figures of the Census of 1881 or 1891.

In a year when measles and febrile affections of catarrhal type are prevalent a high mortality amongst children is to be expected, and further a high female mortality during child-bearing periods indicates conditions unfavourable to the survival of infant life where the care of infant life depends on feeble mothers.

The mortality by class gives instructive results. The mortality of Europeans (18·60) is a little higher, 0·4, while the mortality of Eurasians (25·40), Jains (42·73), and Jews (20·91), is lower than in 1890. The mortality in the following communities is higher than in the last year:—Mussulman (38·29), the mass of the Hindu population (25·06), Hindoo low castes (42·50), and Parsees (23·28). The general mortality of the Hindu population is 26·08, varying from 23·6 amongst Brahmins to 47·1 amongst Lingaets.

The causes affecting the mortality amongst the poor classes may generally be stated to be the overcrowding of life, imperfect ventilation of room, and imperfect drainage of house. Just as we find the greatest number of cases of cholera on ground-floors, so we find the greatest sickness and mortality amongst the classes who live most on ground-floors.

Kamathipura is the section of highest mortality (44·41), Parel being second (43·21), Second Nagpada third (42·41), Khara Talao fourth (40·28), Oomerkhari fifth (38·57), and Chuckla sixth (38·26). If the mortality in 1891 is contrasted with 1890 it will be observed that there are certain sections in which the mortality is greatly enhanced.—Sections of continuous high mortality.—These sections are Kamathipura, Parel, Second Nagpada, Khara Talao, Oomerkhari, Chuckla, and Mandvi. The death causes from which the mortality of Kamathipura is in excess are diseases of the respiratory system and measles. The excess death-rate from diseases of the respiratory system and measles indicates the insanitary conditions in this section.

Measles.

The mortality from measles is 435 more than in the last year, and 183 more than the average, 614 deaths were registered. The prevalence of catarrhal affections with diseases of the respiratory system occurring at an abnormal season greatly influenced the mortality from measles. The highest mortality occurred in the first three years of life, the mortality of males being 9·56 and females 8·96.

Small-pox.

From small-pox 108 deaths were registered, being 42 less than in the last year and 105 less than the average. Although the mortality from small-pox was less than in the year before, in August I predicted that cases of small-pox would be prevalent towards the end of the year, and that probably an epidemic would occur in the cold season. In the second quaterly report I wrote "I apprehend that small-pox will be prevalent during the next cold weather," and in September I informed the Standing Committee that they were perfectly certain to have severe sickness in this part of the country between this and next year.

Fever.

The mortality from fevers (6,837) is higher than in the last year, and higher than the average, being 348 more than in 1890, and 470 more than the average. The average, it must be remembered, includes a period of exceptionally low mortality.

The greatest number of deaths occurred in September, March, August, and December. Of the total deaths from fevers, 5,527 were referred to remittent fever, being 164 more than in the last year and 607 more than the average; 382 were ascribed to ague, being 67 more than in 1890 and 121 more than the average; 910 were ascribed to simple continued fever, being 116 more than in the last year and 258 less than the average. The deaths from enteric fever are 1 more than in the last year and the same as the average. 18 deaths were registered from enteric fever.

The mortality by districts is suggestive. In two districts of the suburbs in which the mortality ought to be low, it is high; these two districts are Sewri (14·34), and Parel (15·13). The highest mortality from fevers also occurred last year in Parel, and the opinion which I gave in that annual report has turned out more or less correct. I wrote: "Taking the figures of the census of 1881, the highest mortality occurred in "Parel. This high mortality, although 64 less than in 1889, is in some measure due to "expansion of population, for there has been a great increase of population in Parel, "and it is also in some degree influenced by foul conditions from imperfect drainage "and absence of drainage. The mortality in Mahalaxmi is chiefly ascribable to "increase of population." This opinion on Mahaluxmi has turned out correct. In sections so densely populated as Mandvi (12·78), Khara Talao (11·61), Chuckla (11·02),

we have a high fatality; we can only expect a high mortality in these densely crowded localities, and the mortality is high. Whether in the sections or in the buildings, there is little space for ventilation. They all have densely crowded houses, densely piled so that the space to each person is only:—Mandvi 21·36 square yards, Khara Talao 7·45 square yards, Chuckla 7·75 square yards, and in Mandvi there are tenements having over 700 people. In one chawl in Mandvi, to which cases of cholera were taken, we counted over 700 people. Although Parel and Sewri are portions of the suburbs, yet amidst open space, of which there is still much in both sections, there are still very crowded chawls filled with mill-workers.

The highest mortality occurred amongst two small fluctuating communities—Negro-Africans (102·73), and Lingaets (15·30). It is possible that the mortality in these small communities has been influenced by fluctuation of population. Although the total mortality from fevers is higher, the mortality in the mass of the Hindu population and amongst Mussalman and Jews is less.

From cholera, 164 deaths were registered, being 62 more than in the last year, and 82 less than the average. 229 cases were reported, and 164 ended fatally, giving a mortality of 71·6 per cent. Of the cases more than 68 per cent. were males; 157 males and 72 females were reported to have suffered. The proportion of mortality amongst males being 68·7 per cent., and females 77·7. The percentage of deaths to attacks is less than in the last year. Cholera.

As in previous years, most cases occurred from the population born outside of Bombay, and amongst these cases the highest mortality will be observed. Of the total cases 209 were born out of Bombay, and 150 died:

Birth place.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Bombay - - -	18	12	66·6
Elsewhere - -	209	150	71·7
Unknown - -	2	2	100·0

If the cases are grouped according to period of residence, it is found that 70 of the cases were under three months, and 26 under six months in this city :—

Duration of Residence in Bombay.	Attacks.	Deaths.
Under 3 months - - -	70	39
Under 6 months - - -	26	20

The mortality, according to the source of water supply, is interesting. It will be observed that 16 people who used well water took ill from cholera, and that 15 died, that is, nearly 94 per cent.; although the number of persons who used well water are few, the mortality is higher than amongst persons who used Vehar and Tulsi.

For 1890.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Vehar and Tulsi water consumers -	196	138	70·4
Well-water drinkers - - -	16	15	93·7
Unknown - - - -	17	11	64·7

The death-rate amongst Europeans is high, 1·59 per 1,000, owing to 18 deaths occurring in the Harbour between the 11th September and the 14th September on the following ships:—"Marathon" and "Redbreast" of the Royal Navy.

When cholera is prevalent only a small mortality occurs at early periods of life, but it is remarkable that in this year no deaths occurred during the first 3 years of life. The male and female mortality are equal (0·20), while in the previous 2 years the male mortality was highest.

The mortality by section is interesting. In the last annual report I wrote:—"I "hope for a reduction of mortality in Girgaum generally, as there has been through "drainage and sanitary work, a reduction of mortality in localized portions of this

"district where cholera was once endemic. In Girgaum, as in other portions of the "city where buildings have been improved and more opulent classes attracted and "cesspools removed and drains constructed, fewer cases of cholera occur. In "'Wadies,' where once epidemics were expected every year and preparations made for "them, cases seldom now occur, and when they occur others do not follow. That, "which I may describe as epidemic attraction, has ceased."

This reduction has occurred, and further, in Fanaswadi, where cholera was ever prevalent, no deaths occurred. The freedom of Fanaswadi this year from cholera is remarkable. In the Annual Report for 1888 I thus referred to cholera fatality in Fanaswadi. In 1888 I may mention cholera was epidemic, 379 deaths having occurred.

I thus referred to the incidence of cholera in Girgaum and Fanaswadi. "In the "previous Annual Report I referred to the decrease of cholera in Girgaum and in "Fanaswadi. In this year there has been a resuscitation of cholera in Girgaum, but "in Fanaswadi the prevalence of former years has not occurred. In one portion of "Fanaswadi, in which cholera has been frequently epidemic, and in which many cases "have always occurred when cholera was prevalent in Bombay, very few cases of "cholera have occurred for some years. I refer to Zaoba's Oart, in former years "mentioned in all reports as a place of cholera fatality. The improvements have been "the removal of huts, the arrangement of other huts in lines, the construction of open "drains, and the removal of cesspools. It is instructive that while the population has "increased the number of cases of cholera has yearly decreased."

Phthisis. The mortality from phthisis is 404 more than in the last year, and 405 higher than the average. The mortality is highest, as in the five years before, in the same district 2nd Nagpada (7·08). This district, whose condition and whose house crowding, the greatest in Bombay, I have before described, needs urgently a system of drainage to carry away the refuse of the population. If the 8 sections of highest mortality from phthisis are taken, it will be observed that they are sections of dense compression of house and population.

Respiratory system. To diseases of the respiratory system 4,379 deaths were ascribed, being 1,044 more than in the last year and 562 more than the average. Of the deaths referred to diseases of the respiratory system, 2,805 were ascribed to bronchitis, being 797 more than in the last year, and 429 more than the average; 963 deaths were referred to pneumonia, being 157 more than in the last year and 142 more than the average.

Nervous system. From diseases of the nervous system 2,447 deaths were registered, being 511 more than in the last year and 449 more than the average.

Births. During the year 15,518 living and 1,394 still-born births were registered. Of the living births, 7,964 were males and 7,554 females. The proportion of males to females by the last census was 170·60 to 100, but assuming that there were 100 males to 100 females, the birth-rate would be equal to 32 per 1,000.

APPENDIX.

No. 1.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER with the GOVERNMENT OF INDIA for 1891.

1. *Alteration of Statistical Groups of Stations.*—This Report, as usual, contains much valuable and interesting information regarding the European troops, the Native troops, and the prisoners throughout India. It also summarises in convenient form the facts concerning the general population of the country which have been extracted from the Provincial Sanitary Reports, and which are considered under the great general heads of Vital Statistics, History of the Chief Diseases, Vaccination, and Civil Sanitary Works. One important change has been made in dealing with the statistics of sickness and mortality among troops and prisoners, and that is a re-arrangement of the stations and jails in new geographical groups. The old grouping was devised by the late Dr. J. L. Bryden, the first statistical officer to the Government of India, who did so much in originating and improving the statistics of both troops and prisoners. His aim was not only to show the results by presidencies and individual stations, but also to take the stations in groups which should be illustrative as far as possible of areas subject to similar conditions of climate, and also to similar epidemiological influences, more especially as regards cholera, the course of which he believed to be regulated in great measure by geographical position. The new grouping, which differs materially from the old, has been arranged by a Committee, and is to be adhered to by both Medical and Meteorological Departments. We may glance at what these new groups are, and how far the various bodies concerned are represented in each. The number of stations occupied by European and Native troops in each of them, and the jails they each contain, are shown in the following statement:—

No. and Name of Group.	European Troops.		Native Troops.		Prisoners.	
	No. of Stations occupied.	Strength.	No. of Stations occupied.	Strength.	No. of Jails.	Strength.
No. I.—Burma Coast and Bay Islands (includes Andamans, Rangoon, &c.).	3	1,624	4	2,111	14	18,516
No. II.—Burma inland (includes Thayetmyo, Mandalay, &c.)	6	2,711	29	8,261	18	4,504
No. III.—Assam (includes Silchar, Dibrugarh, Manipur, &c.)	—	—	5	2,157	8	981
No. IV.—Bengal and Orissa (includes Fort William, Barrackpore, Cuttack, and many of the jails of Lower Bengal).	3	2,207	5	3,125	38	10,217
No. V.—Gangetic plain and Chutia Nagpur (includes Dinapur, Lucknow, Allahabad, and many jails of Behar and Oudh).	9	5,714	8	7,079	45	23,111
No. VI.—Upper Sub-Himalayan (includes Muttra, Delhi, Mean Meer, Rawalpindi, and many of the Punjab jails).	15	12,711	14	14,097	34	14,348
No. VII.—Indus Valley and North-Western Rajputana (includes Peshawur, Hyderabad, Kurachee, &c.).	7	4,627	14	15,298	14	6,189
No. VIII.—South-Eastern Rajputana, Central India, and Gujerat (includes Agra, Nasirabad, Mhow, &c.).	10	5,868	21	14,027	12	4,473
No. IX.—Deccan (includes Poona, Belgaum, Secunderabad, and many jails of the Central Provinces).	12	9,490	25	20,265	32	8,381
No. X.—Western Coast (includes Bombay, Cannanore, &c.)	5	1,304	8	3,731	9	2,391
No. XI.—Southern India (includes Madras, Bangalore, Bellary, and a number of the Madras jails).	6	3,579	9	7,742	20	7,113
No. XII.—Hill Stations (includes Quetta, and the hills of all three Presidencies).	24	3,082	14	12,808	9	739
No. XIIA.—Hill convalescent Depôts	9	2,577	—	—	—	—

2. *Suggestions in regard to these Groups.*—In the above only one or two of the most important places in each group have been mentioned. A full detail of all the stations and jails in each can be seen in Table XXII. for European troops, XXIV. for Native troops, and XVI. for prisoners. In Table Y, at the end of the volume, a comparison is made as regards the amount of sickness and mortality among troops and prisoners in the various groups and the proportion in which different diseases contributed to the results. The grouping of stations is no doubt very desirable, and a comparison such as Table Y, institutes is also instructive; but, in making such a comparison, it must be borne in mind that it is by no means exact. The areas concerned in each case are nominally the same, but the places within

these areas are very different. As a rule, the jails greatly outnumber the stations occupied by the troops, and these, again, in many cases are spread over large tracts of country where neither European nor Native soldiers are quartered. Moreover, the stations occupied by European troops differ much from those occupied by Native troops within the same area. We have only two suggestions to make in connexion with this important question of geographical grouping. The first is that the numbers attached to the groups should be the same for all the three bodies concerned—European troops, Native troops, and prisoners. As it now stands, owing to the absence of all European troops in Assam, the numbering of the groups for them varies from the numbering adopted for the other two, and this causes some confusion. The other suggestion we would make is that the area included in each geographical group should be clearly marked out on the map by a thin red line, and the number of the group clearly indicated in the same colour. This could easily be done for all the groups except the hill stations and hill convalescent depôts, which are scattered over the continent. The change has in all probability already suggested itself to the Sanitary Commissioner. The map attached to this Report appears to be the old map, and bears on it the numbers of the areas according to which the statistics of European troops were formerly divided. The preparation of a new map would, no doubt, take time, but the reproduction of the old map, if unavoidable, might have been accompanied by an explanatory note so as to prevent confusion.

3. *General Results.*—The meteorology of the year was abnormal, especially as regards the rains, which were very late and deficient over great part of India. In the tables appended to Section I., the monthly records of barometric pressure and humidity during 1891 are compared with the results of previous years, but no such comparison is made for the rainfall and temperature. The figures for 1891 alone are given, and without some standard by which they may be judged they lose much of their value. The tables for temperature and rainfall might with great advantage be amended so as to correspond in this respect with the other two tables. The general facts of the year's sanitary history are that among European troops, owing in the main to the great diminution of influenza and venereal disease, sickness was less than in 1890, but, owing to the increased prevalence of cholera, the mortality was greater. Among Native troops, also, sickness was considerably less, but the mortality was slightly higher. The same remark holds good for the prison population. Of the health of the people generally we have already spoken in our separate memoranda on the Provincial Sanitary Reports, but we may here repeat the main facts. Over great part of India the year was very unhealthy, and cholera was very prevalent. This may be said especially of the Lower Provinces of Bengal and of the Madras Presidency, including the town of Madras, where the death-rate was very high, and also of Assam. The same remark applies, though in a minor degree, to the Central Provinces, the Hyderabad Assigned Districts, and Rajputana. In the Punjab the death-rate, though still high, showed a great improvement on the results of 1890. In the North-West Provinces and Oudh, in spite of cholera prevalence, the health of the people was better than usual.

4. *European Troops.—General distribution of sickness and mortality.*—Among the 67,030 European soldiers who garrisoned India during 1891 the cases of sickness equalled 1,379, the number constantly sick 79, and the deaths 15·89 per 1,000. As regards sickness, these figures are favourable when compared with those of former years. The mortality was somewhat higher than that of 1890 (13·84), or of the ten-year period 1881–90 (14·24), but under that of the previous ten-year period 1870–79 (19·34). The statistics of 1891, according to Presidencies, stand thus, those of Quetta and Burma, which are included in the Presidency totals, being added for separate comparison:—

European Troops.

	Strength.	Ratios per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
India	67,030	1,379	79	15·89	27	43
Bengal	40,994	1,394	80	16·86	25	42
Madras	13,324	1,304	82	14·49	31	46
Bombay	12,713	1,409	73	14·24	29	43
Quetta	2,162	1,621	62	13·88	—	—
Burma	4,623	1,589	92	20·12	—	—

A comparison of the three Presidencies shows that in Bengal the mortality was highest, that in Bombay the admissions were highest, and that in Madras the daily sick-rate was highest. Compared with the former year, Bengal and Madras exhibit a diminution of sickness, with some increase of mortality. In Bombay also the constant sick-rate was lower than in 1890, but the admissions into hospital were more numerous, and the mortality rose from 9·56 to 14·24. [By a printer's error this is given in the statement at page 13 as only 4·24, and we may also note the trifling error that in the statement at page 11 the strength of the European Army of India should be 67,030 and not 67,000.] At Quetta the year was unhealthy. The admissions rose from 1,099 in 1890 to 1,621 in 1891, and the death-rate from 9·41 to 13·88. Among the troops in Burma, on the other hand, there was some diminution both in sickness and mortality. The statements which are given at page 15 show very clearly what proportion of the sickness and mortality in each Presidency was

contributed by the chief diseases. With regard to the valuable and interesting data which these statements contain it is sufficient for the present to note that in all three Presidencies venereal diseases were the chief causes of admissions into hospital, and that in all of them ague follows next at a varying interval. Among the causes of death in all three Presidencies enteric fever stands highest, then cholera, and then hepatic disease. The results may be studied in greater detail in Table XVIII., where the causes of the sickness and mortality in each of the new geographical groups, and the ratios due to each disease are conveniently ranged side by side.

5. *The Influenza Epidemic.*—In last year's Memorandum we remarked at some length on the remarkable epidemic of influenza which was so widely spread over India in 1890. Its wide prevalence, its varying degree of intensity in different parts of the country, the limitation of the epidemic to certain months of the year, and its disappearance, which was just as difficult to account for as its coming, all demanded attention. During 1891 influenza was again reported at many stations, and there were decided signs of another epidemic. Its intensity, however, was much less than it had been in 1890, as evidenced both by the fewer places attacked, and by the much diminished number of cases. We append a table to continue the history of the disease during 1891 in the same form as that employed to illustrate it in 1890. It has been prepared from the data contained in Tables XXIII. of European troops, XXV. of Native troops, and XIX. of jails.

Influenza among Troops and Prisoners.

——	Strength.	Monthly Number of Admissions into Hospital.												Ratio per 1,000.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
European Troops :														
Bengal - -	40,994	1	—	1	2	8	62	100	27	20	2	—	15	5·8
Madras -	13,324	—	—	—	14	69	22	1	—	—	—	—	1	8·0
Bombay - -	12,713	—	—	—	—	—	7	11	2	—	—	2	5	2·1
Native Troops :														
Bengal - -	66,230	—	—	1	—	13	204	99	106	51	22	15	55	8·5
Madras - -	26,088	—	—	—	—	—	—	—	—	—	—	2	—	·1
Bombay - -	23,780	—	—	—	—	91	55	24	—	—	—	—	119	12·2
Prisoners :														
Bengal - -														
Madras - -	101,019	3	152	91	19	32	119	459	285	266	72	32	388	19·0
Bombay - -														

The statistics of influenza among the prisoners are not given by Presidencies for 1891. The limitation of the epidemic as to time was not nearly so marked, especially in the case of the prisoners, as it had been in the year previous, though the epidemic was much less severe than in 1890. The area embraced was just as wide, extending as it did from Burma in the east to Aden in the west, and from Cannanore to the north-west frontier. As in 1890 the women and children of European regiments suffered very slightly from it. In 1891 it was indeed confined to a very few isolated cases among them.

6. *Considerable Diminution of Venereal Diseases.*—As we have already seen, venereal diseases stand at the top of the list in all three Presidencies as a cause of admission into hospital, and they therefore demand special attention, particularly with reference to the influence upon them of lock hospitals. It is some satisfaction to find that in spite of the abolition of lock hospitals the admission rate for these diseases, high as it is, shows a considerable reduction on that of the year previous. In 1890 the rate for the European Army in India, as a whole, was 503 per 1,000, in 1891 it fell to 400. It is further to be observed that the decrease was not confined to any one Presidency, but extended over them all. The results for the two years were as follows :—

	India.	Bengal.	Madras.	Bombay.
1890 - - -	503	504	491	513
1891 - - -	400	395	402	417

Owing to the change in the areas, it is not possible to compare the results of the two years in the geographical groups; but by taking the details given in Table XXVIII. of 1891 in conjunction with the similar table of 1890, numbered XXVII. in the Report for that year, we can study the data on which the general averages above noted have been framed, and we find that the reduction of venereal diseases has not been confined to a few places but spread over a great many. If we take the cantonments of the Bengal Presidency, which are garrisoned by 1,000 men or more, as

may be seen in the following list, we learn that of the 13 places which come under this category, all but three, marked I., show a decrease, and in several of them the decrease is very marked :—

Station.	Admissions from Venereal Diseases per 1,000 of strength.	
	1891.	1890.
Bengal:—		
Fort William, I.	622	608
Lucknow	330	523
Bareilly, I.	664	526
Meerut	413	573
Umballa	341	395
Ferozepore, I.	277	260
Mean Meer	404	414
Sialkot	451	652
Rawalpindi	383	515
Peshawur	189	418
Agra	449	576
Chakrata	250	373
Quetta	184	263
Madras:—		
Belgaum, I.	439	425
Mandalay	368	787
Bombay:—		
Kurrachee	317	412
Mhow	360	499
Poona	495	571
Bombay (Colaba) I.	591	513

We have added a few of the more important places of the Madras and Bombay Presidencies which bear out the same general fact. Secunderabad and Bangalore would also have been included, but, unfortunately, the garrisons of these places have been sub-divided in the statistics of 1891, so that no comparison can be made with those of 1890. It is satisfactory to find that of the reduction in all three Presidencies great part represents a reduction in the more serious forms of disease.

7. *Venereal Diseases in relation to Lock Hospitals.*—But although the reduction in venereal diseases so far as it goes is a satisfactory feature of the year, they were still a very grave source of inefficiency in the European Army of India, and any measures suggested for preventing them therefore deserve serious consideration. It appears from this Report that a special investigation of the venereal statistics for many years has been made. The figures are not given. They were under the consideration of the Government, but the chief results arrived at are noted, and as the matter is of great importance we shall quote them in full. They are—

"(1) Within at least three years of institution lock hospitals produced a decided effect in checking venereal disease in the stations where they were opened.

"(2) When certain lock hospitals were experimentally closed the venereal ratio for these stations rose to a great height as compared with the ratio of those stations where lock hospitals were retained.

"(3) On the abolition of lock hospitals there was a special rise of the venereal ratios for those stations that had had lock hospitals.

"(4) Taking the period during which lock hospitals were in activity as a whole the ratio for stations with lock hospitals was lower than that for stations without lock hospitals, although the ratio for the former class of stations had been higher than that for the latter class before the institution of lock hospitals.

"(5) When stations are divided into those that had and those that had not lock hospitals it is found that venereal ratios rose in both, but less and less rapidly in the former than in the latter.

"(6.) A very probable cause of the increase of venereal ratios in both classes of stations since 1877 was the increased importation of fresh young unmarried men, the lock hospitals existing in certain stations having there exerted a certain restraining influence upon the increase."

Of the fact that the short service system has tended greatly to increase venereal diseases we have no doubt, nor can it be questioned that the lock hospitals were productive of some good, but we are not satisfied that the amount of this good was by any means so decided as the above conclusions would make out. The idea that a lock hospital once established in a cantonment can effectively control the amount of venereal disease among the European troops quartered there has been only very partially realized in Indian experience. As we pointed out in reviewing the Report of the Sanitary Commissioner for 1889, "the statistics of 1866, before lock hospitals were established, are much more "favourable than those of 1884, when these hospitals had been at work for 19 years." No doubt the short service system had meantime come into play, but whether this was the cause of the increased prevalence of venereal diseases, or whether it was only one of the causes, the practical conclusion remains the same, that the cause or causes to which it was due was apparently but little amenable to lock hospitals.

8. *The Voluntary Venereal Hospitals.*—Of the voluntary hospitals which the Army Sanitary Commission recommended many years ago as places in which women suffering from disease might find shelter and medical treatment only incidental mention is made. It does not appear where they

had been established, when they came into operation, how many women had availed themselves of each of them, what forms of disease they were labouring under, and what relation these bore to the forms prevailing among the garrison. It is very desirable that in future reports full particulars on all these points should be given, as without them it is impossible to form an opinion as to the benefit derived from the voluntary hospitals. How far the general reduction of venereal diseases in 1891 was due to them there are not materials in this Report for judging.

9. *Enteric Fever the Chief Cause of Mortality.*—As venereal diseases claim special attention because they are the chief cause of admissions into hospitals, enteric fever claims special attention because it is the chief cause of deaths. In 1891 the mortality it occasioned in the European Army of India was 5·73 per 1,000, or more than it had ever been previously. There is evidently much divergence of opinion and of practice in the nomenclature of Indian fevers, and it is therefore less likely to lead to error if we consider them all together as they are shown side by side for the three Presidencies in the statement given at page 23. Going back as this statement does to the period of 1870–79, we find that in Bengal the annual admissions from enteric fever have steadily increased from 5·3 per 1,000 to 24·9 in 1891, while the deaths under this head have increased from 2·28 to 6·64; while, on the other hand, there has been a reduction, though by no means to the same extent in the mortality recorded under other fevers. The most important fact remains that from all fevers taken together the annual death-rate has risen in Bengal from 4·02 in 1870–79 to 7·20 in 1891; in Madras from 2·04 to 4·29, and in Bombay from 2·89 to 5·74. No new light has been thrown on the cause of the increase. As usual one fact is very plain, that severe fevers chiefly attack the young, the unseasoned, and unacclimatized. In 1891 the liability of a soldier of 24 and under to die from fever in India is represented by a percentage of 68·65, whereas in the soldier between 30 and 34 years of age this percentage of liability is only 5·35. If the periods of residence be taken, the contrast is even more striking, for while the percentage of liability during his first two years is represented by 64·19, in the sixth to the tenth year it is only 2·34. These and similar facts which are repeated year after year in the history of the British soldier in India admit of no dispute, and they tend to show that the strain of an entirely altered climate and surroundings, so different from anything to which his constitution had hitherto been accustomed, tells on the young soldier new to India, and that the great preventive is to improve the sanitary conditions of his new abode as far as possible. It must also be borne in mind that when a young European soldier lands in India the effects of changes incidental to the action of climatic conditions are added to those which are incidental to the human body at one particular period of its own development, and that his personal hygiene consequently requires more than usual care whilst his constitution is accommodating itself to its new surroundings.

10. *Cholera.*—Although cholera was much more prevalent among European troops than it had been in 1890, the number of cases when we consider the widespread epidemic, as shown on the map, was not large. The total was 252, of which 168 proved fatal. These were distributed over the Bengal and Bombay Presidencies in almost equal proportion; in the Madras Presidency the proportion of cases and deaths was much less. The special table devoted to cholera shows that the 252 cases were spread over a very wide area, embracing such far distant places as Mandalay, Quetta, and Bangalore. In all, 29 stations suffered, but in many of them the disease was limited to one or two attacks. Allahabad with 51 cases in May, Cawnpore with 15 in June, July and September, Nasirabad with 29 in August and September, Peshawur with 20 in September, October, and November, and Quetta with 24 in August and September, present the most noteworthy outbreaks, and a description of them would have been of interest both as regards the course of the disease and the measures taken to arrest it. In Section VI. of the Report in which the history of the chief diseases during the year is discussed, some further particulars are given regarding sanitary defects reported in connection with cholera outbreaks, and also as regards the number of attendants attacked and the effect of moving into camp. Of defects the most important noted is the unsatisfactory state of both drainage and conservancy of the Cawnpore bazaar. Of 628 attendants on 374 cholera cases among European troops only four were attacked, or only ·64 per cent. This return, which is given at page 125, it is presumed includes statistics of the previous year, as the total number of cases of cholera among European troops in 1891 was 252. But however that may be, the immunity of the attendants is most remarkable, and ought to set at rest the fears which are so generally entertained of even approaching near any one suffering from cholera. If the statement be taken as a whole it appears that of 3,063 attendants on 1,473 cholera cases among troops and prisoners only 56 were attacked, or a percentage of 1·83, and small as this proportion is there is not the smallest evidence that the 56 attacked were attacked because they had been in attendance on persons suffering from cholera. The results of moving into camp continued to be generally satisfactory, both as regards the speedy cessation of the outbreak and the general health of the troops. Of 96 parties who moved from 16 cantonments 81 had no further cases. Of the remaining 15 parties among whom 58 cases occurred after moving further particulars might have been given with advantage, especially as regards the degree of promptitude with which the movement was made, for on this success greatly depends.

11. *Sanitary Defects in Cantonments occupied by British Troops.*—There are many other points of interest on which we might remark, but they are, as a rule, clearly and fully dealt with in the Report, and we shall pass on to consider what light is thrown on the causes of disease, especially in those places where British soldiers suffered most. At page 155 a summary is given of the Annual Sanitary Reports on the cantonments of the Bengal Presidency, and in the last column information is contained concerning "diseases prevailing, sanitary defects, suggestions, improvements, &c." In other columns the ratio of admissions and deaths in each cantonment are shown both for European and Native troops. This summary would be rendered still more valuable if it were extended so as to

include all three Presidencies, and if more complete information were given in the last column regarding "sanitary defects." In several cantonments mention is made of defects in drainage and water supply and other matters; but in many of them where the sick list was high, and the mortality heavy, nothing is said of the local disease causes to which these results seemed to be due.

12. *Native Army. General Sanitary History in* 1891.—The extent of sickness and mortality in the Native Army of India is shown in the following statement:—

	Total Deaths per 1,000, including Absentees.	Average Strength present with Regiments.	Ratio per 1,000.			
			Admissions into Hospital.	Constantly sick.	Deaths from Cholera.	Present Deaths from all Causes.
Bengal Native Army - - -	18·10	66,230	1,020	35	3·73	17·32
Madras „ „ - - -	27·28	26,088	1,017	45	1·99	20·05
Bombay „ „ - - -	12·34	23,780	978	31	1·26	9·63
Central India and Rajputana Regiments -	8·96	5,175	628	19	·58	7·73
Hyderabad Contingent - - -	7·83	7,063	529	18	1·13	6·09
Native Army as a whole - - -	19·34	128,600	972	35	2·64	15·44

Compared with 1890 sickness had much diminished. This was in large measure due to the great reduction in cases of influenza, with its respiratory complications. Cholera caused double the mortality it did in 1890, but, owing to diminution under other heads, the death-rate, though high, was somewhat under that of the previous year. But these, which are the general results for the Native Army all over India, are made up of very different elements in its component parts. In Madras, and also in Bengal, sickness and mortality were greatly in excess of what they were among the other bodies of men. The unsatisfactory results in Madras were due in great measure to the unfavourable returns from the portion of the troops serving in Burma. Of these troops Madras furnished 83 per cent., the rest being drawn from Bengal. In the native garrison of Burma, taken as a whole, the admissions into hospital equalled 1,676, the constant sick-rate 76, and the death-rate 36·31 per 1,000.

13. *Sanitary Defects in Cantonments occupied by Native Troops.*—The sanitary sheets which are summarized in the section devoted to Native troops refer to all the three Presidencies, and show the sickness and mortality in each regiment in conjunction with information regarding local disease causes. In many instances the information given under this last head might be more full. When sickness prevails as it did in many of the regiments in 1891, the great object of the Medical Officer, and of all the sanitary authorities, should be not only to provide for the proper treatment of the sick, but also to make diligent search for the cause of the sickness, so that it may, if possible, be removed. In the summary of sanitary sheets there are numerous instances of local defects which are removable. The very great evil of overcrowding existed in many stations; in some it was only slight and temporary, in others more serious and long continued. Defects in drainage and in water-supply, insufficient or too free ventilation, under-feeding, want of fresh vegetables, and severe duties, are all mentioned as causes of sickness. These and other evils are, we doubt not, being dealt with as far as possible, but we wish to record our sense of the great practical importance of these regimental sanitary sheets and cantonment sanitary reports, and the advantage to be derived from having them very carefully prepared.

14. *Military Sanitary Works.*—During 1892–91 the sum of Rs. 98,32,152 was expended on works designed for the health and comfort of the troops in India, but information as to the exact nature of these works was not yet available when the Report was prepared. Details of the expenditure on similar objects during the previous year have been furnished. They consisted in the main of barrack and hospital accommodation, but some expenditure was also incurred in connection with improvement of the water supply at a number of places—Allahabad, Dehra, Rawalpindi, Murree, Quetta, and Wellington. At Quetta and at Secunderabad also the drainage had been improved.

15. *The Jails of India.*—In regard to the jails the first point to be noted is that there was a considerable increase in the prison population compared with that of the year previous. Over India it rose from 96,610 to 101,019, and this quite accords with the ordinary experience in that country, that when food prices are high the jails are generally overflowing. The statement given at page 84 affords interesting data regarding the proportion of prisoners to the general population in the different provinces, and the great variations there presented are worthy of notice, ranging as they do from 2·3 per 10,000 of the people in Bengal proper to 6·1 in the Punjab. The statistics for India as a whole show that there was a considerable diminution in the amount of sickness, to which the decrease in influenza materially contributed, but that the death-rate was much the same as in 1890 (31·89 per 1,000). The results, according to geographical groups, are given in Tables I. to XIII., and these, again, are summarized in No. XIV., the monthly sick-rate, and the causes both of admissions and deaths in each of them being placed side by side so that they can be easily compared. It will be more convenient, however, to consider the jails by administrative areas as shown in the body of the Report, and then consider any of them in which there was excessive sickness and mortality in connexion with the information concerning their condition which is contained in the summary of the sanitary sheets. For practical purposes these are the most important part of

the whole Report. Before discussing them, however, we may tabulate the general results for each of the provinces in 1891.

Province.	Average Strength.	Ratio per 1,000.				
		Admissions.	Constantly Sick.	Deaths from		
				Cholera.	Dysentery and Diarrhœa.	All Causes.
Andaman Islands - -	11,576	1,588	59	—	13·05	41·47
Burma - -	11,444	896	35	4·54	7·78	30·23
Assam - - -	1,106	2,052	70	9·95	31·64	66·91
Bengal - - -	15,069	1,134	39	3·58	8·89	31·39
North-West and Oudh -	27,809	752	34	3·52	7·41	27·83
Punjab - - - -	12,292	1,742	40	·98	4·72	28·31
Bombay - - - -	7,265	691	27	·41	4·96	33·45
Berar - - -	1,063	438	14	—	1·88	11·29
Central - - - -	4,675	791	28	—	10·27	30·37
Madras - - -	8,313	687	24	9·86	10·94	38·25

16. *Results as compared with former Years.*—We may glance at some of the more important results in the above statement, and see how they stand when compared with those of other years. In the Andamans the health of the convicts as represented by the admission-rate showed much improvement, but the constantly sick-rate was the same as it had been in 1890, and the mortality, 41·47, was very high. (Through a misprint in the statement regarding the Andamans on page 85, this is entered as only 4·47.) The Burma jails also show diminished sickness and increased mortality, but the excess here was comparatively slight. In the Assam jails there was great sickness, the admission-rate having been 2,052, and the mortality very heavy (66·91). Bengal, in spite of the unhealthy character of the year in that part of India, presents a favourable return, and the same is to be said of the North-West Provinces, the Punjab, and, in a still more marked degree, of Berar, where there was the minimum admission-rate (438) and the minimum death-rate of only 11·29. In the Bombay jails, with diminished sickness, there was an increase of mortality, and the same remark applies to the other two provinces—the Central Provinces and Madras.

17. *Individual Jails in which there were Excessive Sickness and Mortality.*—The Sanitary Commissioner has specially noted the jails in each administration where the prisoners suffered more than usual, and we shall refer to a few of these, endeavouring at the same time to connect their unfavourable history with insanitary conditions as set forth in the jail sanitary sheets of which a summary is appended to this section of the Report. In Port Blair in the Andamans, the defects noted are faulty ventilation, scarcity of vegetables, and unhealthy labour, involving exposure in malarious jungles. In 15 of the Burma jails more or less overcrowding is noted. At Toungoo, where the death-rate reached the maximum of 109·51, the water-supply is reported to be "doubtful." In two of the Assam jails there was some overcrowding. Eighteen of the jails in Bengal are noted in which the mortality was in excess of the provincial ratio, ranging from 31 to 123 per 1,000. Overcrowding is an evil which frequently occurred in the Bengal jails during 1891. We observe that it is reported in 27 of them to a greater or less extent. In many cases more information is desirable. For example, it is said in regard to one jail, and the formula is not unusual, "sickness and mortality due to a malarial disease, "diseases of digestive organs and cholera"; but, from a sanitary point of view, what is desired, is a full account of the local causes which produced these diseases. Imperfect drainage is mentioned in several jails as a cause of disease, and it is to be inferred, though more definite data on this point are frequently wanting, that the water-supply was not above suspicion. In Purneah, where, among a small body of prisoners the death-rate was highest, the results are set down to "climatic causes," which, though they are no doubt potent, do not fall within the province of practical sanitary work. In 22 of the jails of the North-west overcrowding is noted, but it was generally only temporary and partial. In some, defective drainage and indifferent water are also noted as causes of disease. In the Punjab jails the statistics of 14 are given separately, in which the mortality varied between 33 and 55 per 1,000. In 12 jails of the province, overcrowding existed in greater or less degree. Among other causes of sickness are mentioned impure water, bad drainage, defective ventilation, and filthy surroundings. In 10 of the Bombay jails there was some overcrowding. In Berar, also, three of the six jails note this defect, and it was also common in the Central Provinces and in Madras. In Berar, as already noted, the health of the prisoners was good, notwithstanding any overcrowding that occurred; but it is none the less true that overcrowding is a great evil that ought to be prevented, and that among no class of persons have the deleterious effects on health which arise from it been more marked than among prisoners.

18. *Further Researches on Cholera.*—The further researches which have been made on cholera are of much interest, and the conclusions which have been arrived at are of great practical importance. They do not by any means tend to establish Koch's bacillus as the cause of the disease. On the contrary, it appears that "there is more and more evidence to show that the prevalence of comma "bacilli in choleraic media is a consequence and not a cause of abnormal conditions in the host."

19. *General Conclusions on all the Indian Sanitary Reports for* 1891.—Sections V., VI., VII., and IX. of the Report are devoted to the general population, to an examination successively of the vital

statistics, of the history of the chief diseases, to the progress made by vaccination, and to civil sanitary works. All these important matters we have already fully discussed in our separate memoranda on the Provincial Sanitary Reports. In these memoranda there has necessarily been much repetition. In all of them the same subjects have to be dealt with—in all of them there are much the same questions to be answered, the same difficulties to be encountered, the same problems to be solved if possible. Our aim has been to treat them all from a purely practical point of view. We are satisfied from the year's records that sanitation is really making progress in India, and that it is in the main advancing on a sound basis. Here and there too much importance seems to be attached to purely theoretical considerations; but, as a whole, the authorities are alive to the great fact that the only sure basis of successful sanitary administration is the improvement of local conditions, especially as respects drainage, water-supply, conservancy, and the other great requisites of health. We are glad to observe that some of the suggestions we have made in previous memoranda for rendering the reports more complete and for directing them more clearly towards this great practical object have been accepted, and have already to some extent been acted on. Where they have not yet been acted on, we have repeated them in noting on the report concerned. A few of the more important of these suggestions may be here recapitulated.

(1.) The necessity for the constant inspection of the registers of births and deaths and comparing them with the data obtained on the spot.

(2.) The desirability of illustrating the results so obtained by detailing in every annual report the facts elicited at a few of such inspections.

(3.) The importance of making the registration circle in every case the unit regarding which all information should be collected, so that in each of them the birth and death rate may be considered side by side with the local sanitary conditions.

(4.) The importance of collecting data as regards the extent of vaccination over a series of years in conjunction with the statistics of small-pox over the same period, and in the same locality, so that the evidence respecting the influence of vaccination in checking small-pox may be fully examined.

(5.) In connexion with vaccination there is another point which deserves attention, and that is the very varying proportion between the number of primary vaccinations and re-vaccinations in different provinces. This is to be seen very strikingly in the general Statement No. II. appended to Section VII. of the Report of the Sanitary Commissioner with the Government of India. In Bengal, for example, out of a grand total of 1,537,648, vaccinations performed during 1891–92, 10,334 were re-vaccinations. In the Punjab, out of a grand total of 611,576, no less than 190,093 were re-vaccinations. Until the annual births have been fully overtaken by the vaccinators, which has not yet been by any means accomplished in a single province, it would be well that the energies of the Vaccination Department should be devoted, as far as possible, to primary operations.

(6.) In reviewing the Reports for 1891 we have had occasion to revert to what we have said in previous memoranda on the great importance of investigating carefully and of describing fully the conditions of localities, and especially of those localities in which disease is prevalent. Such work should form the basis of all true sanitary progress, for in order to remove or remedy causes of disease, the first step must be to ascertain if possible what these causes are. From this point of view the practical importance of the sanitary sheets of Native troops and jails, and of the Cantonment Sanitary Reports, does not seem to be so fully realized as it ought to be. The discovery of disease causes is often a matter of no small difficulty requiring careful and patient search, and the difficulty is increased by the fact that over great part of India there is as yet no special machinery for the purpose. In every cantonment and civil station, however, there already exists a staff of officers whose function it is to deal with the question, and it is very desirable, especially when there has been more than ordinary sickness and mortality, that more definite and earnest endeavours should be made to discover the cause. It seems to us that the investigation into the causes and conditions under which any given outbreak of disease has occurred requires to be thoroughly and systematically undertaken at the time when all the facts are fresh in the minds of local observers. Such investigations cannot generally be successfully prosecuted by those on the spot, who are already fully occupied in the treatment of the disease itself, but should be undertaken by some independent body of inquirers numbering among them some one with the requisite technical knowledge of sanitary engineering in its practical application to public health. As regards similar procedure directed towards the general population, the Presidency towns are already provided with health officers. In most of the larger towns throughout the provinces, the civil surgeon of the district is a member of the municipal committee, and has ample opportunity of urging reforms, and of pointing out the evils which must continue so long as these reforms are not carried out. We are well aware that this work is being done in many places. What we desire to urge is that the reports should contain full information—first, as to the local causes of disease which exist in each locality, and secondly, as to the measures which are being taken to remove them, and this information should be repeated year after year so that the evils themselves, and the necessity of reform, may never be lost sight of. The villages present the most difficult problem, and we shall watch with much interest the working of the various schemes of sanitation which have been devised for them, more especially that which has been inaugurated in the Central Provinces, because it seems to deal with the question more systematically than any of the others.

(7.) There is only one other point on which we would touch, and that is the necessity for having a properly educated sanitary engineering staff. The institution of the Sanitary Board in each province has been a most important step, and one which has already been shown to be productive of much good. But it should be recognised that sanitary work requires special knowledge and that to appoint any one as sanitary engineer who has not had experience in sanitary work is to appoint one who must acquire his sanitary experience at the expense of the towns and villages. In acquiring this experience it is certain that he will make mistakes, and will incur much wasteful expenditure. We would, therefore, suggest that at least a certain proportion of the engineering staff provided for India should be specially trained and instructed in all sanitary work.

21st July 1893.

No. 2.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bengal for 1891.

Census for 1891.—This report could not be completed for several months after the usual time for submission owing to the want of the census figures, and the numerous calculations which were required to be made on them entailed further delay. These figures form the basis of the statistical tables of births and deaths for 1891. The total population of the province according to the new census is returned as 70,368,267, compared with 65,859,534 in 1881, so that during the ten years there had been an increase of 4,508,733. As the registration of births during these ten years has been confined to municipal towns, it is not possible, as it is in most of the other provinces, to test the results of registration during that period by the results obtained at the census. In Bengal such a calculation might, however, be made for the municipal towns, and this we suggested in our memorandum on the Report for 1890. It is very desirable to place the facts frequently and forcibly before the municipalities, and the census figures afford an excellent opportunity of doing this. On this point nothing could well be more striking and instructive than the remark made by the Sanitary Commissioner that "while the Census of 1891 shows the population of towns to have increased "during the last ten years by 92 per 1,000 the municipal birth statistics of 1891 would prove it to "be decreasing at the rate of 6 per 1,000 in one year."

2. *Registration of Births.*—In the municipal towns, with a population according to the new census of 2,716,424, the births registered equalled 21·46 per 1,000. In 1890, the ratio taken in the same population was 19·71, so that there has been some improvement. There is, however, good reason to believe that both these rates fall far short of the actual truth, and the details for the 141 separate towns which appear in Form I. supply ample evidence of the imperfection of the figures similar to those which we cited last year from the Report of 1890. The birth-rate varies from 2·95 to 44·57, and the number of male births to every 100 female births from 40 to 165. In only 34 out of the 141 municipal towns did the births recorded outnumber the deaths. In many of them the excess of deaths is very large. This remarkable result, though in great measure ascribed to neglected registration, appears also to be due in some places at least to disproportion of the sexes; for whereas the male population of the towns during the ten years increased by 169,991, the female population increased by only 60,585. It would be interesting and important also in its bearing on the statistics of individual towns to know how far these results are general, or if not, what places were specially affected by them. It would seem from the statement contained in paragraph 5 that prosecutions for neglecting to give information regarding births have in many places been frequent, but there is no relation observable between the *primâ facie* accuracy of the rate and the number of such prosecutions. In many places, with comparatively high birth-rates, they have been few or altogther absent, while the same state of things accompanies ratios which are manifestly most incorrect and give unmistakable evidence of neglect. Two important steps have been taken with regard to birth registration in Bengal. The work of recording births has been transferred from the municipalities to the police, and birth registration, which for many years had been confined to municipal towns, has been made general over the province. These changes were to take effect from the beginning of 1892. It is to be hoped that they will both be attended with success. So far Bengal has been most backward in the matter of registration, and especially of the registration of births. If we take the results of 1891, we find that the following birth-rates have been returned by the other provinces of India:—Madras 42, Bombay 36, North-west Provinces 33, Punjab 34, Central Provinces 43, Hyderabad Assigned Districts 42, Assam 28. In all of these the registration is general; in Bengal, where it was confined to 141 municipal towns, the rate recorded was only 21.

3. *Registration of Deaths.*—Over the province generally the year was very unhealthy, and the recorded deaths reached the ratio of 26·94 per 1,000, compared with 22·94 in the year previous The record bears every evidence of being far below the truth, and the Sanitary Commissioner, who is of this opinion, states that, as the mortality cannot be under 34 per 1,000 instead of 26, nearly 500,000 deaths must have been left unregistered. The generally unhealthy character of the year is shown by the fact that in 36 out of the 45 districts the death-rate was higher than in 1890, and in many of them much higher. In Nadia, for example, it was 45, compared with 20, or more than double; in Jalpaiguri 41, compared with 28; and so on in diminishing contrast, as may be seen in

the statement given at page 4. From this same statement, also, it appears that in 115 out of 144 towns the mortality was in excess, and in some of them considerably in excess, of the rate for 1890. In Malda, for instance, it was 93, compared with 35; in Chatra 61, compared with 36. The excessive death-rate was thus manifested both in town and rural circles. In both it was recorded mainly under the heads of cholera and fevers. It is only in respect of cholera that the mortality is given according to registration circles. This is done in a large map, which is entered at page xlii. of the Appendix. It is unwieldy, and difficult to refer to, and we would suggest that in its place a statement should be given, either in diagramatic form, such has been long in use in Bombay and lately adopted by Madras, or in any other form which may be found most convenient, to arrange all the registration circles according to the total mortality in each of them. Such a comparison not only supplies a useful check on the registration, but also directs attention to abnormal rates which call for local inquiry, both as to their accuracy and the conditions to which they seem to be due. A similar statement for births would also be most useful.

4. *Causes of high Death-rate.*—The causes of excessive sickness and mortality may be divided into general and local. Among the general causes attention is drawn to the abnormal meteorology of the year, as manifested in the marked deficiency of rain. For the province as a whole this deficiency amounted to 15·80 inches, and, if the districts be taken separately, it will be found that of the total of 45 only eight show an increase over the amount that fell in the year previous. In most of these eight districts the increase was trifling, but in Singhbhum it was large, and equalled 17·16 inches. In all the other districts there was a decrease in the annual rainfall, and in many of them this decrease was very marked. In 14 of them it equalled or exceeded 20 inches, and in two it showed a maximum deficit of over 80 inches. That the abnormal character of the year in respect of rainfall was connected with its unhealthiness may be accepted as a fact, because, if it acted in no other way, it must, to a large extent, have rendered the water-supply deficient, and more impure than usual; but the statistics of mortality and rainfall for 1890 and 1891 do not seem to establish any definite relation between the two. In some, with an increase in the rainfall, there was also an increase in the mortality; in others, a very large deficit in the rainfall is attended with but a trifling increase of deaths; while in others, again, a great increase of deaths accompanies a trifling deficiency of rain. The statistics of deaths in Bengal are, however, as yet so imperfect that no decided conclusions can be drawn from the figures. As regards the food of the people, it is said that "the outturn of crops "was below the average in 36 out of the 44 districts, in which the price of food grains was conse- "quently higher than the average." Among the general causes of the increased mortality of 1891, the Sanitary Commissioner places the Ardhodoya Jog fair, which took place early in February. Indeed, he seems to consider this as the most powerful factor at work in producing sickness, and more especially cholera, which was very prevalent, and was, he believes, in great measure due to its dissemination by the pilgrims. That pilgrims are themselves especially prone to cholera is a fact which has been illustrated on many occasions, and it would be strange if they were not, considering they are under the very conditions most favourable to disease. These conditions are fully described by the Sanitary Commissioner, who speaks of the pilgrims as having "suffered many privations and "hardships, and arrived at their destination in an exhausted condition, to suffer more privation and "hardships among the enormous crowds of people assembled" at the fair. How many of these fairs were held does not appear. They are spoken of as having taken place "at the several bathing- "places on the Ganges and its tributaries." Some further account of these bathing-places and of the probable number of bathers at each would have been of interest. There can, however, be no doubt that, in the aggregate, the number was very large, and the fact that such a vast multitude of people were exposed to unhealthy influences, especially in a year which from other, and perhaps still unknown, causes was itself very unhealthy, no doubt added much to the sickness and mortality. Whether the pilgrims were the means of causing an epidemic of cholera in any part of Bengal during 1891 we shall discuss in the next paragraph. As to the local causes of unhealthiness, the scant rainfall, as already mentioned, would diminish and also cause deterioration of the water-supply in towns and villages, but on this important question of local conditions it is desirable that more complete information should be given in every annual report, towns being described individually and villages by groups. The only data of this kind which are given for 1891 are to be found in Appendix V., which contains the "Sanitary Estimate" of a few places which, apparently, had not been entered in previous reports. We are not losing sight of the inspection notes made by the Sanitary Commissioner on visiting a number of places during the year, but we think it important that, as far as possible, the local conditions of towns and village circles should be described shortly side by side with their birth and death rates year by year.

5. *History of the Chief Diseases: Cholera.*—The year was one of great cholera severity. Throughout the province 229,575 deaths were attributed to it, or the equivalent of 3·26 per 1,000. Every district suffered more or less, and every month returned many victims to the disease. During 18 years the province had only once suffered from cholera so severely, and this was in 1876. In 1891 the fair early in February was held as specially sacred, the number of pilgrims was unusually large, and to this, as already stated, the spread of the disease has been ascribed. But when we come to examine the evidence on which this opinion is based, we find little to warrant it. Facts are wanting to substantiate the conclusions advanced. For example, the civil surgeon of Jalpaiguri, which district suffered more than any other in Bengal, except Purnea, says, "cholera was introduced into the "district by pilgrims returning from the *Ardhodoya Jog* festival; it spread rapidly and took on a "virulently epidemic form," but no dates or other details are cited. In this district no cholera deaths were recorded in January, but in every other district where the epidemic is ascribed to importation by pilgrims in February, the disease had already shown itself unmistakeably in January.

There was no need of importation, because it was there already. In some districts the January deaths from cholera were few, but in others they were very numerous, especially in the Dacca Division and parts of the Presidency and Chittagong Divisions. In the district of Pubna, where the disease is ascribed to the fair in February, the number of deaths from cholera in that month was very much less than it had been in January, only 122, compared with 472, and it is worthy of notice also that in the province as a whole the total deaths from cholera recorded in this month of February, in the early days of which the fair was held, were somewhat less than the total of January. The matter is of importance solely in its practical aspect. It is far from desirable to lead the people to believe that by stopping fairs, and by shunning pilgrims or others, they will protect themselves from cholera; though it is important, especially in unhealthy seasons, to discourage fairs as far as possible, and so diminish the number of persons exposed to unusual fatigue and privation. The proper remedy is to regulate the sanitary conditions at the places where the fairs are held, and to protect towns and villages alike, by improvements in water-supply, drainage, and all other sanitary requisites. We note that a set of rules for the better sanitary regulation of fairs was being considered by the Government of Bengal.

6. *Small-pox and Vaccination.*—Not only was cholera prevalent during 1891, small-pox and other diseases also, more than ordinarily swelled the mortality of the year. The deaths from small-pox numbered 16,193, more than they had been in any year since 1884, when they amounted to 18,533. Of the 16,193 deaths recorded, 10,065 were those of children under 12 years of age. The district of Cuttack suffered most, the small-pox mortality there having equalled 1·70 per 1,000. Among towns the mortality reached the maximum of 8·95 in Midnapore; in the rural area of Maslandapur in the same district the rate was even higher (9·42). These unsatisfactory results are attributed, and no doubt they are in great measure due, to shortcomings in the vaccination department. This department has now been reorganised, the chief feature in this reorganisation being, that in future each civil surgeon will be responsible for vaccination throughout his district. Steps have also been taken to secure an abundant supply of good lymph. This is now turned out in large quantities from the Animal Vaccination Depôt in Calcutta, and is reported to be of good quality. Of all the important matters to be attended to in vaccination, this is the most important of all. We observe, in connexion with the statistics of Chittagong, that the lymph which had been previously supplied there had been bad, and did not afford the promised protection from small-pox—a result much to be regretted, not only in itself, but also because it does much to retard the acceptance of vaccination by the people. The general management and supervision of vaccination over such a large and populous province as Bengal is a vast undertaking requiring constant care and watchful attendance to many details, and it is therefore well that the department should be more decentralized than it has been hitherto, and that the civil surgeons should be required, as they are under the new organisation, to aid more largely and directly in this important work. So far the results achieved by vaccination in Bengal have been disappointing, and this is fully acknowledged. The Sanitary Commissioner remarks: "In the Bihar circle, the districts which are supposed to have "been protected by Government agency return a higher rate of mortality than those in which "vaccination has not yet or only partially been introduced. There is only one explanation of this "unsatisfactory result, and that is, that the work of vaccination in the so-called protected districts "was not thorough." During the year 1891–92 for which the separate report is furnished, there was a considerable reduction in the number of vaccinations performed which is ascribed to the unhealthiness of the year, and other causes. In connexion with the outturn of the department, the two most important practical questions are—how far is the infant population, which is being added year by year, protected by successful vaccination, and what relation does the mortality from small-pox in each district bear to the successful vaccination which had been recorded in it? In answer to the first question, there is no doubt that a vast amount remains to be done. Births for many years have been registered only in the towns, but the statement which the Sanitary Commissioner enters in paragraph 12 of the Vaccination Report estimates the total births of the province at 40 per 1,000. This gives a total of 2,813,926, and assuming that of these 339,744 die before they complete their first year, there remain 2,474,152 infants available for vaccination every year. The actual number successfully vaccinated in 1891–92 was only 292,438. As regards the second question, two diagrams are given, one to show the death-rate from small-pox in each district during the year and the other the proportion of population protected by vaccination during the seven years 1885–92. The two sets of lines present considerable fluctuations. The Lieutenant-Governor in his orders on the report remarks that "the figures show on the whole that increased "protection does carry with it, as a general rule, an appreciable reduction in the death-rate. This "result will tend to be more conspicuous as time goes on, and a larger proportion of the population "comes to be protected." The contrast in their relation to small-pox between well-vaccinated communities, and those which have been most imperfectly protected, should be most striking, and the municipalities naturally supply localities where such contrast might be most prominently illustrated. The results in municipalities should be more favourable than those in rural areas. But so far this has not been achieved. In 1891, out of an estimated addition to the population of municipal towns of 96,578 infants, only 18,122 were successfully vaccinated. In the municipalities, moreover, the mortality from small-pox recorded in the registers (·48) was more than double that of the rural areas (·22). The diagrams to which we have referred are of great importance, because they forcibly bring vaccination to the only real test which can be applied to it, and that is the amount of protection it affords the people against small-pox; but we would suggest that the facts would be still more clearly illustrated if they were brought into one diagram, the lines for small-pox and vaccination for each district running immediately side by side.

7. *Fevers and other Causes of Deaths.*—The year was remarkable not only for the heavy loss of life due to cholera and small-pox, but also for the great mortality ascribed to fevers. In 1890, also, fevers had been unusually prevalent, and added more largely to the deaths than any previous year on record. This result was ascribed in the main to the excessive rainfall. In 1891 the fall was most deficient, but the fever mortality instead of diminishing was even higher than it had been in 1890. It is said: "Last year the high rate of fever mortality was attributed to excessive "rainfall. This year, paradoxical as it may seem, the still higher death-rate must be attributed "principally to deficient rainfall." The reasons assigned for this conclusion are not convincing, and it would rather seem as if over and above the meteorological condition of excessive or deficient rain there was some other unknown factor at work determining the results. Indirectly the deficient rainfall must have acted prejudicially in deteriorating the water-supply, and as the Sanitary Commissioner observes, "the impoverished condition of the people also, owing to the failure of crops "and high prices of food, in other words, a lower standard of living, had much to do with the febrile "unhealthiness of the year under report." Not only were prices dear, but the cultivators, owing to the want of water, were more than ordinarily exposed to fatigue in endeavouring to irrigate their lands. These are all points in regard to which more details would have been of interest, but we have failed to discover in the statistics adduced any direct relation between the extent of the fever mortality and the deficiency of rain. In the district of Malda, for example, the increase of fever mortality over 1890 was 16·90 per 1,000, and the deficiency of rainfall 26·42 inches. In Nadia, with a fever mortality not much under that of Malda, the deficiency of rain was only 6·01 inches. In the district of Pubna this deficiency was 13·37 inches, or more than double that of Nadia; but the fever mortality, instead of showing any increase with this deficiency, was somewhat less than it had been in the year previous. The other great heads under which mortality is recorded do not call for special comment. Dysentery and diarrhœa and injuries each contributed much the same number of deaths as in the year previous, but under the designation of other causes there was a considerable increase.

8. *Sanitary Works.*—The Sanitary Commissioner believes that the dysentery and diarrhœa peculiar to the hills are due to a particular micro-organism, but whether this view be accepted as correct or not, or whether we agree with him in ascribing excessive fever mortality in one year to heavy rainfall and in the next year to deficiency of rain, there can be no question as to the practical side of sanitary work, and that the best, and in fact the only real antidote to these and other diseases, is to be found in sanitary improvements. It is, therefore, all important to know what is being done in this direction. Section 9 of the report shows that Rs. 13,37,569 were expended by municipalities on conservancy and other sanitary purposes, but out of this should be deducted the considerable item of Rs. 2,41,032 for treatment of the sick. No great work of improvement seems to have been carried out during the year, but Appendix III. contains a list of minor improvements executed not only in towns but also in rural areas. Some of these were made at the cost of private individuals whose names are given. Among the more important items in the municipal list are drainage works at Serampore, acquisition of land for general improvements in the 24-Pergunnahs, extension of water works at Dacca, and preparatory drainage works at Patna. It is gratifying to learn from the orders of the Local Government that several large schemes were under consideration, and that the new Municipal Bill was expected to give a great stimulus to progress in this respect. We are glad, further, to notice that with few exceptions there is a growing desire on the part of the Municipal Commissioners to do all that can be done "for the benefit of the towns committed to their "care, to give effect to simple and inexpensive advice, and, as far as their limited means will allow, "also to the larger principles of modern sanitary science." Of this some interesting particulars are furnished in separate inspection reports on a number of places which the Sanitary Commissioner has appended.

9. *The Sanitary Board.*—During the year five formal meetings of the Sanitary Board were held, at which many most important schemes of improvement were discussed. Among these may be mentioned the water-supply for Howrah and other municipalities on the right bank of the Hooghly, for Purulia and other places, also for the drainage of Puri, Faridpur, Jessore, and other localities. In addition to these formal meetings the Sanitary Engineer visited many municipalities, and advised them on the practical measures to be taken for improvement. The Government has materially simplified preliminary surveys by purchasing instruments which are hired to municipalities as they are required, and by which means they are saved needless expense. This arrangement might be followed in other provinces.

27th June 1893.

No. 3.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the North-Western Provinces and Oudh for 1891.

1. *Progress of Registration and means of Improvement.*—In considering the vital statistics which form a large part of this and of all the Provincial Sanitary Reports of India, two great practical questions claim attention. First, how far has accuracy yet been attained in the collection of these statistics; and, secondly, what steps can be taken to ensure greater accuracy in them? The Sanitary

Commissioner believes that "the general registration of births and deaths in the united provinces is "undoubtedly effected with considerable accuracy," but that the causes to which deaths are attributed are not to be trusted. This defect was fully to be expected, and was indeed anticipated when the system was first inaugurated. The prime object to be secured was the registration of the birth or death, and until a vast change comes over the country little more can be looked for. The main endeavour should, therefore, be directed to this prime object. No doubt, as the Sanitary Commissioner observes, considerable accuracy has been attained, a wonderful degree of accuracy; in fact, considering the rude machinery employed; but there is evidence in the returns, and more particularly in the extremes of the birth-rates in different places, that much still remains to be done in securing a more complete recording of both births and deaths; and we believe that more will be gained by attempts to improve the simple notice of these facts than by endeavouring to secure a more accurate entry of the cause of death, which, under present circumstances, cannot be had. The first step towards greater accuracy in general registration is to examine the returns in detail—by registration circles, the unit on which all is based. This is already done by the Sanitary Commissioner as regards deaths in the tabular statement which covers pages 23 to 30. In that statement the death-rates from small-pox, fevers, dysentery and diarrhœa, and all causes, are entered for every circle of registration in the province, and the materials of which the district averages are composed can there be examined in detail. We would suggest that the mortality from cholera should also be shown separately in this statement, and that a column should be added to contain the birth-rate. The statement would then be complete, and would afford a ready means by which attention can be at once directed to the spot where inquiry is needed, first as to accuracy of the returns, and then, in the event of no sufficient reason appearing to doubt their accuracy, to further inquiry as to the local causes of the unusual figures. It is to the importance of these local inquiries that we would draw attention, and to the desirability of their occupying a more prominent place in annual reports, both because they are of interest and also because this more prominent notice is calculated to lead to practical action. The Deputy Sanitary Commissioner of the first circle in his report remarks, in regard to the condition of the registration, that births were often found to have been omitted in villages, and that the towns also showed too low a rate. The Deputy Sanitary Commissioner of the second circle says that "deaths, as a rule, are very fairly accurately rendered, but a certain number of births, especially "those of female children, are omitted." In the third circle, the Deputy Sanitary Commissioner is of opinion that "registration is still very imperfect, and the cause of death frequently inaccurate." A few illustrations of the actual figures gathered from the registers, on the inspection of one or two towns and villages, as compared with the data obtained by questioning the people on the spot, would give a better idea of the actual state of registration than any other means that could be adopted.

2. *The Census of* 1891.—Although the statistics are all calculated on the Census of 1891, full details of this census were not available when this report was written, and various questions which the Census figures suggest are therefore left to be discussed in the Sanitary Report for 1892. In our memorandum on the Report for 1890, we drew attention to the general confirmation of the registration returns derived from the fact that the net result of the 10 years of registration on the Census of 1881 showed only a slight variation from the population returned by the Census of 1891. From the more accurate figures now supplied, it appears that the difference between the two is only 95,608, an altogether inappreciable difference in dealing with nearly 47 millions of people. At the same time, it is to be noted that this general result contains a number of districts in which the deduced population falls considerably short of the Census population, and others in which the reverse is found, though not to the same extent. The Sanitary Commissioner in his remarks dwells on the errors that arise from taking the Census figures for 10 years as the basis of calculating either births or deaths, which increases gradually as the new Census approaches, and he proposes to obviate these errors by supplementary statements, such as he has given in this report, in which the population each year is corrected by adding to that of the previous year all the births of that year and deducting all the deaths, by following, in fact, the same method for each year which we have already mentioned as having been taken with the ten-year period from 1881 to 1891. The plan has much to commend it, if the supplementary statistics are confined to separate tables in the body of the report and do not interfere with the standard statements in the appendix. With this proviso it might be adopted in all the reports.

3. *Births.*—The birth registration seems to fail in the omission of many female births. Over the province as a whole, in 1891, the male registered births preponderated in the proportion of 110 to 100 over the female births. Every district shows some such preponderance which, in the Meerut district, reached the maximum of 117 male to every 100 female births. The records of previous years in the North-Western Provinces and Oudh yield similar results, and the same remark applies more or less to the other provinces. In Madras the proportion was lowest, only 103 male to every 100 female births; in the others it ranges from 106 in the Central Provinces to 114 in the Punjab, in some parts of which it is looked upon almost in the light of a disgrace to record the birth of a girl. The extreme variations in the district rates of the North-Western Provinces and Oudh during 1891 merely repeat the experience of former years, and of other parts of India, and show that registration is still imperfect. The Sanitary Commissioner ascribes the low brth-rate of the year to "the excessive mortality in the spring and autumn months of the previous year;" and this, along with the increased sickness which such mortality indicates, must undoubtedly have had a marked effect in diminishing the number of births. We have not, however, been able to connect the low birth-rates of certain districts in 1891 with high death-rates in those districts during 1890, or to find evidence in the statistics of these two years of the reverse conditions. It is disappointing to find that in many, even of the larger municipalities, the registration of births is so much neglected. Of this, Benares,

with a birth-rate of only 22·50, is an extreme example; but we note that of 101 municipalities 20 recorded a birth-rate under 30, while in 28 it was over 40 per 1,000. In 20 districts out of the total of 49 in the province the deaths recorded were in excess of the births, the proportion varying from ·34 to 13·78 per 1,000. In several of the municipalities the excess death-rate was greater even than this, while in a few, to which special attention is drawn in the orders of the Government on this Report, this excess varied from 17 to no less than 51 per 1,000.

4. *Deaths.*—Although the year was one of epidemic cholera, the general health of the people in spite of this was better than usual, and much better than it had been in the year previous. Fevers were less prevalent, and the epidemic of influenza had practically disappeared. The death-rate for 1891, which stands at 31·14, is less than that of six out of the ten preceding years, even when the ratios of these ten years have been amended by calculating the deaths on the annually increased population obtained on the system of "natural increase" adopted by the Sanitary Commissioner. As was to be anticipated, especially in a year of epidemic cholera, the death-rate varied greatly. In districts it ranged between 20 in Dehra Dun, and 47 in Sultanpur, and in the larger municipalities between 23 and 52. In the smaller municipalities the range was wider even than this. In the statement already referred to as showing the death-rates from small-pox, fevers, dysentery, and diarrhœa, and all causes in each registration circle arranged by districts, the variations even within the same district are very remarkable. We may instance a few examples. In the district of Kumaun, the minimum was 15 and the maximum 54; in Shahjahanpur, the minimum was 15 and the maximum 70; in Muzaffaragar the range was from 22 to 105; in Muttra from 15 to 52; in Furakhabad from 18 to 182. Attention has already been drawn by the Local Government to some of the more remarkable figures in this statement. The Sanitary Commissioner has given a diagram to illustrate the monthly mortality of 1891, as compared with the decennial mean monthly ratio. We have frequently urged the obvious objections to such comparisons. A mean composed of great extremes is not a standard which can be employed with any useful result. More would be gained by delineating each year separately.

5. *History of the Chief Diseases: Cholera.*—In 1890 cholera had been prevalent and added materially to the mortality. The deaths in that year numbered 80,295. In 1891 the disease was more prevalent still. It added 3·60 per 1,000 to the mortality, and the number of deaths amounted to 169,013, a larger number than had ever been recorded before in any one year, with the single exception of 1887, when it reached the maximum of 200,628. The statistics of cholera for 22 years, which are tabulated in the report at page 13, are very instructive. They show how fluctuating the disease is in different years and different districts, how certain years are marked by a general character for prevalence or abeyance of the disease, while in other years, along with general abeyance over most of the province, certain places suffered more than in any other year. Of this the figures of 1870 afford a striking example, so striking, in fact, that we are inclined to doubt their accuracy. The cholera death-rate of the Gonda district in that year, 51·2, is more than double that recorded in any other district during the 22 years in question. In Gonda itself the next highest is only 8·25 in 1887. The provincial total for 1882 given in the statement (20·2) would also seem to be a misprint. The most striking features of the epidemic of 1891 are its widespread prevalence, its early manifestation in the year, and its long persistence, especially in the Eastern districts, where also it was most severe. The cholera map has not yet been prepared according to the revised form now generally adopted in the sanitary reports, and the areas of comparative prevalence and exemption are not clearly indicated The distribution of the disease within these areas, which cannot well be detailed in any map, comes out most clearly in the Annual Form (No. VII.) devoted to cholera, and there it will be seen that even in these districts which suffered most, such, for example, as Sultanpur and Partabgarh, a very large proportion of the villages escaped.

6. *Its relation to Sanitary Defects.*—From a practical point of view, the great thing to be done is to consider local prevalence in conjunction with local defects, and to ascertain how far these are capable of being remedied. In the diagram before page 17, certain towns in which the disease was prevalent are ranged in order according to their death-rates from cholera, and in Appendix F. an abstract is given of the sanitary reports on towns showing the death-rate and the conditions of the water-supply, drainage and conservancy. Unfortunately, this appendix includes only those municipal and Act XX. towns which had been inspected during the year, and many of those which appear in the cholera diagram are not to be found in it. Taking a few examples of places which are entered in both lists, we find Kairana, a town of 18,420 inhabitants, with a cholera death-rate of 32·14, with a water-supply which is described as "indifferent" and "polluted," "most indifferent drainage," and "bad conservancy." Banda, with 23,071 inhabitants, suffered from cholera to the extent of 13·87 deaths per 1,000. Here the water is reported to be "indifferent" and "liable to pollution," and the "drainage imperfect," and much the same is said of Fyzabad and Furrakhabad and other places that might be cited. There is no want of evidence of the relation of such defects to cholera prevalence. Cannot more decided and systematic efforts be made to remedy them?

7. *Cholera and the Hurdwar Fair.*—In connexion with the history of cholera in the North-Western Provinces during 1891, it is satisfactory to note that the great *Kumb* Fair at Hurdwar in that year passed off without any outbreak, either at the fair or after it. The event had been looked forward to with much apprehension, in consequence of the unfortunate experience of the two previous *Kumb* fairs occurring at 12 year intervals, one in 1867 and the other in 1879, and the history of cholera in other parts of the province during the early part of 1891 increased these apprehensions. The usual efforts were, therefore, made to keep everything connected with the fair in the most perfect sanitary state possible. No opportunity fortunately occurred for testing whether an epidemic of cholera can

be averted by the prompt isolation and disinfection of the first cases. The magistrate, in his report, certainly speaks of two cases of "undoubted cholera," having occurred during the most crowded period of the fair, but the Sanitary Commissioner enters no case of cholera in his returns. He enters only "three suspicious cases," and from the details given it seems clear that although it was very proper to regard them at the time as suspicious, they were really not cases of cholera at all. Every credit is due to all concerned for the excellent arrangements made at the fair; but in looking on the events from an epidemiological point of view, it must be borne in mind that Saharunpore, in which the Hurdwar fair is held, and the other neighbouring districts, Bijnore, Muzaffarnagar, Meerut, Dehra Dun, and Garhwal, all preserved almost complete immunity from cholera while the fair was being held as well as before it, although they must have been exposed to the invasion of many thousands of pilgrims from the eastern districts, in which cholera was very prevalent and had been prevalent for weeks.

8. *Small-pox and Vaccination.*—The history of another year in relation to small-pox is favourable. In 1891 the mortality fell to less than one-half of what it had been in 1890, and the records over 22 years go to prove that epidemic outbursts of the disease are less frequent than they used to be, and that when they do occur they are more localized. In 1891 only two districts return deaths from small-pox in excess of 2 per 1,000, and only three of the towns fall into this same class. The town of Barhaj returned the maximum mortality of 14·97 per 1,000. No mention is made of any local circumstances favouring this result, or of anything in the history of vaccination in that place to which it could be attributed. It is very desirable that when excessive mortality such as this does occur, local inquiry, if possible, should be made, both as to the facts and the causes to which it is to be assigned. Excepting in the eastern districts of Gorakhpur, Azamgarh, and Ghazipur, the registration circles show a remarkable immunity from small-pox. Many escaped altogether, and in very few did the mortality exceed 1 per 1,000. In those three districts, on the other hand, nearly every circle suffered, and many of them severely. In all of them the proportion of persons successfully vaccinated in 1891 was small as compared with many other districts. The returns of vaccination for the province as a whole in 1891–92, for which year the usual annual report has been prepared, show considerable progress. More than one million of persons were operated on, of whom 900,731 were operated on with success. There was a slight falling-off in the number of infants successfully vaccinated. This is attributed to the diminished number of births in 1891 as compared with 1890, to which reference has already been made; but the proportion of infants successfully vaccinated was only 24·26 per cent. of the total births. The registered births amounted to 1,559,888, whereas the successful vaccinations in infants amounted only to 378,512. Of the deaths recorded under the head of small-pox, more than a half were in children under 12 years of age. It is worthy of notice that, for the first time in the history of these provinces, vaccination was carried on throughout the year from the commencement without any supply of lymph from England. Animal lymph propagated at several depôts was found amply sufficient. In addition to the general supervision exercised by the Sanitary Commissioner, the vaccination branch of the Provincial Sanitary Department consisted of three Superintendents or Deputy Sanitary Commissioners, seven Deputy Superintendents, 50 Native Superintendents, and 770 vaccinators, besides 43 apprentices. It seems very desirable that this large subordinate staff should gradually be educated and trained so as to be fitted to take an intelligent part in general sanitary work, and not confine themselves to the one simple operation of vaccination.

9. *Sanitary Defects.*—In the history of fevers and of the other great causes of deaths indicated in the statistics, there is nothing which calls for special remark. Owing, apparently, in some measure, to the diminished prevalence of influenza, there was a reduced mortality under fevers. The autumn fevers were also less rife than they had been in 1890. Further particulars regarding influenza would have been of interest, but the above embodies the only reference made to this disease. It is not said where it was most severe or what was the time of its appearing and disappearing. The Sanitary Commissioner has given two diagrams, which illustrate in a very graphic way the great loss of life that goes on every year in Indian towns and villages as compared with what occurs in England, and the tabular statement which follows them supplies further particulars of high death-rates in many of the registration circles of the North-Western Provinces and Oudh. When we come to inquire into the local causes of these results we feel the want of more complete information. The only portion of the report which seems to deal with such causes is the abstract of sanitary reports of towns which forms Appendix F., but this appendix includes only the towns which had been inspected during the year. We have already made some extracts from this appendix in connection with cholera mortality. Many of these towns still manifest very glaring defects in water-supply or drainage or conservancy, or sometimes in all three, which it is most desirable should be remedied.

10. *Sanitary Works.*—The record of another year's work shows that much has been done in this direction, and that further improvements are in contemplation. Of major works the most important are the completion of the water-supply works for Allahabad and Almora, and the commencement of works for the same object at Benares, Cawnpore, and Naini Tal. The drainage of the country lying between the Burhganga and the East Kali Nadi, which had been water-logged, is another most important work, in which good progress had been made. The details for each district, which are given in Section IX., show that considerable sums were expended on minor improvements, such as the construction and repair of drains, the sinking and cleaning of wells, the erection of slaughter-houses and latrines, and the like. It is gratifying to learn from the concluding remarks of this section that "great sanitary improvement is being effected in most of the more important and in many of "the minor municipal towns," and that "the improvemements initiated and carried out during the "past few years have been very extensive." Where great sanitary measures have been inaugurated, such as the waterworks at Agra, Allahabad, and other places, it would be interesting to know

clearly, by comparison with former years, and also with other places not already provided with pure water, what change in the public health had been effected by such reforms. The relative prevalence and fatality under separate headings unfortunately cannot be given with any accuracy, but the total mortality from all causes affords an excellent basis for comparison. Such an inquiry as we now suggest would not only be of interest, but if it clearly showed, as we have no doubt it would, that great sanitary improvements had been attended with a decided diminution in the death-rate, the fact could hardly fail to serve as a powerful incentive to the introduction of similar reforms elsewhere.

11. *The Sanitary Board.*—In Appendix A. proceedings of three meetings of the Sanitary Board are entered, but although mention is made in them of several important matters having been discussed, it does not appear what definite conclusion was come to on them, or what action was taken in regard to them. In the orders of the Government on this sanitary report it is said that "an annual report, "containing a succinct account of its work during the year, should, in accordance with instructions "issued, have been submitted by the Board." Such a report would be a most useful annual record of what was being done. In the Village Sanitation Bill, as introduced into the Provincial Legislative Council, some changes have been made from the lines sketched in the previous report. As it now stands, it is intended to secure a better water-supply, not only to villages with a population of over 2,000, but also to towns under Act XX. Two other Bills have also been introduced in the interests of sanitation, one to regulate lodging-houses, and the other to provide for the construction and maintenance of sewerage works in municipalities. We would suggest that when the Acts on these and other sanitary matters have been passed, they should be appended in full to the annual sanitary report, which should be the repository year by year of all important information on subjects connected with the public health.

27th June 1893.

No. 4.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of the PUNJAB for 1891.

1. *Improvement in Health compared with* 1890.—The results of the year 1891 in the Punjab present a favourable contrast to those of the year previous. The year 1890 had been extremely unhealthy; fevers in particular had been most prevalent and fatal, especially in certain parts of the province, and the access of deaths over births showed a loss of 7·79 per 1,000 of population. In only 13 out of the 31 districts had the births equalled or exceeded the deaths. With an average mortality of 46·87, to which several of the districts contributed more than 50 per 1,000, and Sialkot in particular contributed no less than 102, 1890 was a year long to be remembered for its specially unhealthy character. In 1891 the results were much more satisfactory. The death-rate fell to 29·13. The excess of births over deaths yield an increase of population of 4·89 per 1,000, and increase is the general rule. In only eight districts did the deaths exceed the births, and this chiefly occurred in the frontier districts in which registration, and especially the registration of births, is very imperfect. The general increase would have been considerably more, but, as we shall see presently, the great unhealthiness of 1890 told very adversely on the birth-rate of 1891. The excessive mortality of 1890 was associated with heavy rainfall in the third quarter of the year; in 1891, on the contrary, the fall was less than usual in this quarter. The Sanitary Commissioners shows in detail that this was the case in 18 out of 22 districts compared; that in two of the others, where the monsoon is always light, the difference is very slight, while in the remaining two, which really form the only exception to the general rule of the year, the heavy rainfall was attended with a high mortality from fever. Food was slightly dearer than the average of the previous five years, but the rise was not such as to have an appreciable effect on the health of the people.

2. *Births.*—The births recorded during 1890 equalled 39·08 per 1,000. The ratio for 1891 is only 34·02, but, in comparing the two, it is to be borne in mind that the statistics of 1890 are based on the census of 1881, whereas those of 1891 are based on the census of 1891, which shows a large increase in the population. If the population of 1891 be taken as the standard of comparison, it appears that the annual birth-rate of the previous five years stands at 35·7, whereas the rate for 1891 is 34·02. The sanitary Commissioner ascribes the falling-off, and no doubt with much reason, to the great sickness of 1890. The details which he has furnished bear out the deduction, for the most marked diminution in the number of births is found just nine months after the great autumn sickness of 1890. After that there is a decided rise. The general results for the province as a whole are still vitiated to a considerable extent by the continued imperfections in the frontier districts, where it is hoped that, in consequence of repeated orders, some improvement had been effected, but where much still remains to be done. Even leaving them out of account, there is considerable variation in the results, from 28 to 39 per 1,000, and no doubt still more marked variations would be observed if the records of each registration circle were available. It is very desirable that the minimum and maximum rate in these circles should be given district by district. It is only by examining the details of which the average is composed that a just estimate can be formed of the value to be attached to the general result, while the occurrence of marked extremes show at once where local inquiries should be made. The high proportion of male to female births—114 to 100—is in itself suspicious of imperfection in the registration, and the suspicion is increased

by finding that this high ratio is caused in the main, though by no means entirely, by an excessive ratio of male births in the frontier districts.

3. *Deaths.*—The district mortality varied between 20 in Hazara and 41 in Delhi. For the province it stood at 29·13, which is calculated to be nearly 2 per 1,000 less than the average of the previous five years, but individual years differ so much in India that it would be more instructive to compare with the maximum and minimum of five years, or of any other period, than with the average. The Sanitary Commissioner notes that in the district of Dera Ghazi Khan abnormal mortality was due in part to what appears to have been an outbreak of relapsing fever. In Dera Ismael Khan it would seem that typhus fever was common in May, while influenza prevailed severely in November and December. In Peshawur also, during the cold months, typhus fever was reported to be more than ordinarily common, and in the autumn months cholera was epidemic. Such were the causes of heavy death-rates in these districts. Of the general course of the mortality of the year as distinguished from that of ordinary years, attention is drawn to the fact that the death-rate of January and February was abnormally high, a legacy from the great sickness of the preceding autumn. Unusual mortality in July was due to influenza, which commenced in May and attained its maximum in July. The favourable returns of September, October, and November were to be accounted for by the remarkable abeyance of malarial fevers, while in December a higher death-rate than usual was ascribed to an outbreak of malarial fever in the eastern part of the province, and to influenza in some portions of the west. According to sex the death-rate showed practically no difference. Among both males and females it was 29 per 1,000. We remarked last year on the higher mortality recorded among females as a feature peculiar to the Punjab, but it would seem that the result was in great measure due to the calculations of late years having been made on the Census of 1881. When taken on the Census of 1891, the excess female mortality is reduced to 1·79 for 1890, 0·94 for 1889, and 0·59 for 1888. The death-rate among children in the Punjab, and especially among infants under one year, presents a remarkable contrast to the records of the other two provinces whose reports for 1890 we have already considered. The results stand thus:—

RATIO of DEATHS per 1,000 of POPULATION.

	Under 1 Year.		1 to 5 Years.	
	Male.	Female.	Male.	Female.
Hyderabad Assigned Districts	323	280	116	100
Central Provinces	397	340	43	36
Punjab	160	152	44	45

We fear that little dependence can be placed on any of these figures, but it is well to draw attention to the great disparities they show. Unlike these other provinces also the Punjab returns a much lower death-rate in the rural circles than in the towns—28 compared with 35 per 1,000. The Sanitary Commissioner believes that this is to be explained by the better sanitary conditions under which the people in the villages live. In every respect, he thinks they are better situated as regards health, except in the matter of water supply, which is better protected in the towns. Yet, notwithstanding the great advantage which a purer water affords, he is of opinion that this is more than compensated for by the other advantages which the dwellers in the villages enjoy. In forming a conclusion on this point, the experience of other provinces must be considered as well as that of the Punjab, and it will be seen from what has been already said that the results in the Punjab are at variance with those in Berar and the Central Provinces.

4. *Results of the Census.*—The statistics of 1891 are based on the census of that year, and advantage has been taken of this renumbering of the people to test how far the increase of population which it reveals accords with the increase arising during the ten years since 1881, when the previous census was held—how far the number of births registered was in excess of the number of deaths. According to the census the population of the province has increased by 2,018,649, whereas the increase, based on the excess of births over deaths, amounts to 1,480,458, or a deficiency of 538,191. The census gives an increase in every district except Delhi, where there is a small decrease. According to the registration there should have been a decrease in three districts, of which Delhi is one; if the frontier districts be excluded, for the registration in them has been long known to be imperfect, the deficiency in the registration statistics as compared with the census is reduced to 254,687. How far the results have been affected by immigration and emigration is another question, on which the Census Report may supply some information.

4. *Measures to Improve the Registration.*—The Sanitary Board of the province, we are informed, had the subject of the regstration of vital statistics before it at more than one of its meetings during the year, and in the beginning of 1892 submitted to the Government certain recommendations with a view to obtain more accurate results, both in municipalities and rural circles. What these measures were has not been stated. They will no doubt be explained when the orders of the Government have been issued and they have been definitely decided on. We see no mention of any inspection of the registers. In the matter of general sanitary inspection the Department was very active. From Section X. we learn that the Commissioner himself inspected many towns and villages, the Deputy Sanitary Commissioner inspected others, and a large number in addition was inspected by Civil

Surgeons and Assistant Surgeons. In testing the Vaccination Returns also an immense number of places were visited. The registration of both births and deaths would naturally form a subject of inquiry on all these occasions. More particulars of these inspections would be of interest, and the facts elicited in respect of the registration would be valuable. It is mentioned that when the birth or death rate of any circle as given in the weekly returns falls below the average the Deputy Commissioner of the district is requested to make inquiry and, in the event of there having been negligence, to enforce the necessity of greater care. Frequent inspection of the registers, and comparing the entries with the information to be gained on the spot would, we believe, prove useful, especially if this were done not only by the sanitary staff but by all officials on tour.

6. *History of Chief Diseases: Cholera.*—The principal facts regarding cholera during the year are that the disease was much more prevalent than it had been in 1890, the deaths having numbered 10,107 compared with 3.401, that the epidemic was still slight when contrasted with many others which have occurred in the Punjab, that it commenced about the same time of the year as it usually does, and disappeared about the time it had done before, that it was widely prevalent, having affected almost every district of the province, and yet that the individual places attacked were very few—of 37,579 towns and villages deaths from cholera were reported from only 1,039. The districts of Peshawur and Kohat suffered more severely than others, the death-rate from cholera in them having been respectively 4·82 and 3·57. In Ludhiana it was 1·54 and in Lahore 1·47. In none of the other districts did it amount to 1 per 1,000. There is thus abundant evidence of a widely diffused, and yet comparatively mild, epidemic. From the narrative recorded regarding the first cases in the district of Hissar, the outbreak there would appear to be ascribed to travellers returning from Hurdwar. There is, however, no evidence connecting them with the few other attacks which subsequently occurred. But, whatever be the truth on this and other controverted points in regard to cholera, there can be no difference of opinion as to the action required. Quarantine is an impossibility, the isolation and disinfection of cholera sick in Indian villages is equally impossible; and even if such measures were possible, the experience of those communities in which they have been attempted has not been by any means encouraging. Every energy ought therefore to be devoted to carry out sanitary improvements as the only efficient means of preventing the disease. The Sanitary Commissioner has furnished an interesting statement comparing the mortality from cholera in the villages and towns of the province in 1891, and the result he adduces is, that while this mortality in the villages equalled 6·73 per 1,000, in the towns it equalled only 1·82. Similar contrasts are supplied by the statistics of 1890 and 1889. He believes that the excessive cholera mortality in villages may be connected with the greater liability of their water supply to pollution. However this may be, there can be no question that the improvement of the water supply of villages is one of the most pressing reforms called for in the provinces of India, a conclusion which is fully recognised in the orders of the Local Government on this Report.

7. *Smallpox and Vaccination.*—The history of the province as regards smallpox continued to be very favourable. Deaths from this disease were never so few in the Punjab during any year as they were in 1891. They numbered only 3,426, whereas the smallest number ever recorded previously was 6,379 in 1882. The facts bear strong testimony to the excellent work of the vaccination branch. The highest death-rate in any district was ·68 in Bunnu, where vaccination is carried on with more than ordinary difficulty. Whenever the weekly returns during the vaccination season show several deaths from smallpox, vaccinators are at once sent to the place. The Vaccination Report for the year 1891–2 is given separately, and contains much interesting matter. It shows that, though there was a decrease in the number of operations performed, compared with the previous year, the total vaccinations amounted to 812,700, of which 620,604 were primary. Of these primary cases 94·8 per cent. were successful, and of the re-vaccinations 54·21. The results were verified to a large extent. Among 14,222 recently vaccinated children the Sanitary Commissioner found 96 per cent. with successful results. The Deputy Sanitary Commissioner, the Native Superintendents, the Civil Surgeons, and also the Assistant Surgeons, inspected many thousands of others and found that the measure of success above claimed as the average outcome of the year's work had not been exaggerated. Smallpox, like other epidemic diseases, has its periods of activity and comparative quiescence, and there were decided signs in December of 1891 that the disease was much more prevalent than in any other month of the year, and that the record of 1892 would in all probability not be so favourable as that of 1891.

8. *Fevers.*—The deaths registered under the general head of fevers show a large reduction on 1890. In that year the number was 692,511, in 1891 it was 442,254. If both be calculated on the population of 1891, the ratios stand as 21·52 for 1891 and 33·69 for 1890. The district rates of 1891 vary from 14 in Montgomery to 27 in Delhi. The contrast between the figures of the most unhealthy districts in 1890 and those of the same districts in 1891 is very striking, as may be seen from a few examples.

DEATHS per 1,000 of population.

	From Fevers.		From all causes.	
	1890.	1891.	1890.	1891.
Sialkot	83	25	102	34
Gujranwalla	76	26	85	31
Gujrat	69	25	79	29
Gurdaspur	50	23	65	32

The fevers of 1890 were the usual malarial fevers, apparently aggravated by a very heavy rainfall. In 1891 these fevers were remarkably in abeyance. The contrast between the two years would have been even more striking than is brought out by the statistics but for the fact that other diseases came into play in 1891 which were not of malarial origin, but fell to be recorded under the general head of fevers. Typhus and relapsing fevers were reported from several of the frontier districts, and there were two widespread epidemics of influenza. The first, beginning in May, reached its *acmé* in July, and the second, beginning in November, was causing a large number of deaths at the close of the year, and, it may be added, continued in 1892.

9. *Sanitary Defects.*—The sanitary estimate of towns and rural circles which forms Appendix A has been modified so as to give the total death-rate from all causes in each of them, and to show in a separate column the measures which were being taken to remedy the defects in each locality. These are valuable alterations, because they aid the practical work to be done. There is one point, however, in this sanitary estimate which we have not been able to understand, and that is the difference in the number of circles shown in this estimate as compared with the number shown in the statistical tables. To take the first district, Hissar. According to the estimate there are 5 municipalities and 22 thanas in this district, total 27; but in Tables VII. to X. the number of registration circles in Hissar is only 22, and so on with the others. In nearly every instance the number of "thanas" is the same as that of the "registration circles," the "municipalities" in the estimate being extra. And yet the total deaths recorded in Tables VII. to X., as may be seen on comparing the figures with those of Table VI., are the deaths for the whole province, including both town and rural circles. There is, no doubt, some explanation of the discrepancy which we have been unable to find, and we call attention to it because the registration circle is the unit which ought to be observed throughout as the area for which the statistics of deaths and disease should be prepared, and within which the local conditions should be considered in connection with these statistics. In addition to the more local defects in drainage, water-supply, and conservancy with which the sanitary estimate deals, attention has been drawn, in connection with the prevalence of malarial fevers, to the need for larger measures of improvement in the drainage over certain areas, the importance of which is fully recognized by the Government, but, as is observed in the orders on this Report, "these drainage works are expensive, and can only gradually be carried out."

10. *Sanitary Works.*—In actual sanitary work considerable progress was being made. In addition to minor improvements tabulated in the estimate, the following may be cited:—The completion of the Delhi Waterworks and the sanctioning of the first part of a drainage scheme for that city; the extention of water supply and sewerage at Simla; drainage of the towns of Faridabad in the Delhi district, and the extra-mural drainage of the towns of Jallundur and Ludhiana; the sanctioning of a scheme for the water supply of Amritsar; a water-supply project for Dalhousie; the completion of the water-supply works for Peshawur city, and both drainage and water supply at Kohat. In addition, schemes of improvement for other places were being considered, and the preparatory steps taken towards their being formulated and put in hand. Everywhere throughout the Punjab there is more or less evidence that steady progress is being made.

11. *Sanitary Board.*—The Sanitary Board of the province held six meetings during the year. Among other matters which occupied their attention, the following are deserving of notice:—The condition of the water-logged areas of the province, the causes, and remedy; the most urgent sanitary wants of eight towns reported by the Sanitary Commissioner; the improvement of the registration of births and deaths, especially in the frontier districts, and among Europeans and Eurasians throughout the country; and also the draft of a Village Sanitation Act.

27th June 1893.

No. 5.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Burmah for 1891.

1. *Measures for the Improvement of Registration.*—During the year certain steps were taken with a view to effect a more accurate registration of births and deaths, a matter of sanitary administration in which Burmah had hitherto been very backward. The special attention of local authorities was called to the subject, and orders were at the same time issued that test circles should be selected in each district in which, under careful supervision, it was hoped that more trustworthy data might be obtained, which would prove not only valuable in themselves, but also serve as a standard by which the results in other places might be compared. A copy of these orders has not been furnished in the Report, an omission which should be remeded in future, because all such orders should find a place in the sanitary history of the province, where they can be at all times readily available for reference. It is not very clear how many of these test circles were to be brought into operation, or what special form of supervision was to be exercised over them, and although the dates are given from which the test circles were selected, it does not appear at what period of the year the orders actually came into effect. It seems, however, that the test circles were to be confined to certain areas within towns, and that such circles were selected in 16 towns at different dates between

November 1890 and December 1891. In our memorandum on the Burmah Report for 1890, we gave reasons for doubting whether the institution of test circles would be attended with much benefit to registration generally throughout the province, but as the system has been inaugurated, it is very desirable that it should have a fair trial, and that full information should be furnished regarding its working. It would appear that great delay occurred in selecting test circles in certain districts, and that the information obtained from them is incomplete. A full examination of the results for 1891 was therefore not possible, but the statistics of 1892 ought to supply all the requisite data. As a further step towards improvement, the vaccination staff has been directed to aid in testing the rural returns, and in future the Sanitary Commissioner will show the birth and death rates not only for districts as a whole, but also by registration circles, so that the extremes which make up the district averages may receive prominent notice. The vaccinators in testing the registers will at the same time find data calculated to aid them materially in their own special work, both as regards births and also as regards deaths from smallpox, but we would again press the importance of inspection of the registers by all officials on their tours, work which would not take up much of their time, which would supply a good additional check on the local authorities, and, at the same time manifest to the people the interest which the Government take in the subject.

2. *Births.*—Seeing the very great imperfections in the vital statistics, no detailed analysis of the results is called for as respects either births or deaths. During 1891 about 10,000 births were registered over the number in 1890, but the birth-rate of the province which here, and as regards the other statistics, represents Lower Burmah only, was only 20 per 1,000. The district ratios varied from 12 in Thongwa to 30 in Tharrawaddy. The census figures of 1891, which are used as the basis for the annual tables, do not point to disproportion in the sexes as a cause of such extremes, which can only be attributed to imperfect registration. The imperfections of this registration are the more evident if the results be compared with those obtained in other provinces where the system is in more successful operation. The birth-rate of Lower Burmah in 1891 stands at 20, in the Punjab it was 34, in the Hyderabad Assigned Districts 42, and in the Central Provinces 43 per 1,000.

3. *Deaths.*—Similar shortcomings are to be found in the statistics of deaths. The mortality of the province in 1891 is set down in the annual table as only 15 per 1,000. In the three provinces above cited it ranged from 29 to 40. Indian death-rates vary enormously, and no one rate can be accepted as a standard, but it is incredible that the deaths in Burmah in 1891 equalled only 15 per 1,000. The omissions seem to have occurred chiefly in the rural tracts, for whereas the town mortality amounted to 29 the rural mortality registered was only 14. The Sanitary Commissioner on this point observes, "roughly speaking, it may be said that about one-half of the deaths among the rural population escaped registration." The large proportion of male to female deaths recorded, 123 males to every 100 females, is further evidence of the great imperfection of the registration. The districts of the Tenasserim Division yield an average death-rate of only 12, in the Toungoo district of this division the rate was only 9. The 73,190 deaths registered during 1891 are thus apportioned under the different heads:—

Cholera	2,400	= ·52	per 1,000
Smallpox	1,326	= ·29	„
Fevers	35,658	= 7·76	„
Dysentry and diarrhœa	4,162	= ·91	„
Injuries	733	= ·16	„
Other causes	28,911	= 6·29	„
Total	73,190	= 15·93	„

The large number of deaths ascribed to *fevers* and *other causes* is worthy of notice; of the total due to all causes (73,190), no less than 64,569 are referred to those two heads.

4. *The Census in Relation to Registration.*—The population as enumerated in 1891 forms the basis on which the results in this Report are tabulated. According to the census of 1881 the population was 3,653,629, according to the census of 1891 it was 4,595,569; it had increased by 941,940. The figures were obtained too late for thorough analysis, but in next annual Sanitary Report for Burmah it is hoped that their bearing on the registration of the decade will be carefully examined, not only by districts but also by towns. The evidence of the two censuses is not necessary to show the errors in registration, but it may be useful to bring the facts home more clearly and to point where the discrepancies are most marked. Immigration was believed to be a factor which would largely disturb any comparison between the results of the censuses and those of registration of births and deaths, but we observe that the increase in population during the ten years, as noted by the Sanitary Commissioner, has been due in far the greater proportion to an increase of "Burmans or Buddhists;" they account for 811,743; Hindus for 54,065; Mahomedans for 41,622; Christians for 26,551, and other classes for 7,959.

5. *History of the Chief Diseases: Cholera.*—This disease was not very prevalent during the year. It accounted for 2,400 deaths, which were very unequally distributed, the brunt having fallen on the districts of the Irrawaddy Division, and those of the Arakan Division having almost entirely escaped. The facts would have been shown more strikingly on the map, if it had been tinted in different shades so as to illustrate the incidence of cholera in different parts of the country. The disease was widely diffused. Of 817 circles of registration 188 recorded deaths from it, and yet the proportion of villages which furnish the deaths was very small, only 547 out of 17,807 in the province. Making

every allowance for errors and omissions, the general result remains very striking; it is the usual history of cholera, a disease very widely operating, and yet affecting comparatively few localities within the area affected. We observe from the statement given at page 5 that in not a few places the cholera mortality was heavy. In Toungoo, for example, there were 35 deaths or a ratio of 7 per 1,000. In Tamayar circle 79 deaths, equal to 8 per 1,000; in Maubin town 44 deaths, equal to 8 per 1,000; in Taungu Circle 199 deaths, equal to 10 per 1,000. This last is the maximum recorded. Some particulars of the cause of the disease throughout the province, and of the more severe outbreaks would have been instructive, especially if taken in conjunction with the sanitary state of the places in which they occurred.

6. *Small-pox and Vaccination.*—In the Orders of the Chief Commissioner on the separate Vaccination Report for 1891–92, attention is called to the falling off in the number of operations, especially in certain districts of lower Burmah, and also to the diminution in the percentage of success in primary cases, while on the other hand the percentage of success in re-vaccinations was suspiciously high. Particulars are given in the annual statements of the working of the Department both in Upper and Lower Burmah, where it has been long in existence; the results fall far short of those in other provinces. In Lower Burmah during the year the number of persons successfully vaccinated per 1,000 of population was only 21. In Upper Burmah it was only 14. In both parts of the province the percentage of success claimed in the primary cases is the same, 85. In paragraph 45 a statement is given to show the number of cases actually verified by civil surgeons and hospital assistants, but this would be more instructive and constitute a more effective check on the vaccinator's returns if, instead of entering the number of successful cases seen and comparing these with the number of successful cases claimed in each place, mention were made of the total number of cases seen and of the number of these that were found successful. The ratio of success deduced from these figures could then be compared with the ratio of success claimed in that particular locality. Tried by the number of successful vaccinations among infants, the returns are not very satisfactory, for only 20,328 infants in Lower Burmah were protected during the year, whereas the births, even taken at the defective ratio of 20 per thousand, numbered 95,332. The Sanitary Report does not contain much information regarding the history of small-pox in the province during 1890, nor is there any evidence adduced to show that it is being controlled by vaccination. Certainly the deaths of 1891 ascribed to this disease (1,326) were much less numerous than the total of 1890 (3,693), but the statistics of a series of years indicate great fluctuations. In 1886 there was a minimum of only 115 deaths from small-pox in Lower Burmah.

7. *Fevers and other Diseases.*—The deaths attributed to fever constituted as usual a very large portion of the total mortality. The deaths under this head, and also under dysentery and diarrhœa, were considerably in excess of the numbers recorded in the year previous. The statement contained in paragraph 24 exhibits the local incidence of these diseases in the townships of Lower Burmah; of these 98 appear in the statement, whereas in Table No. VI. of the Appendix, a standard form designed to illustrate the mortality in the town as compared with the rural circles of the province, the number of towns given is only 25. Yet most of the 98 are towns of considerable size; with one exception they all have a population exceeding 5,000, and, with four other exceptions, the population of each exceeds 10,000. It would seem, therefore, that many of these towns must in Table VI. be included in the country tracts. Again, in the summary of the sanitary condition of the principal town and headquarter stations in Lower Burmah, which forms paragraph 28, there are differences in names and populations which we are unable to understand, and which cause great confusion. Whether in town or country, the registration circle should be the unit, not only for examining the returns of mortality but also for recording the sanitary state of the locality, so that the one may be compared side by side with the other. Form VI., which is intended to exhibit the results in towns as compared with the country, should show all the towns individually in which the population amounts to or exceeds 5,000.

8. *Sanitary Defects.*—The summary in paragraph 28 already referred to contains many examples of sanitary defects. At the town of Akyab the water derived from shallow wells and tanks was very liable to contamination; the drains in the main bazaar continued faulty. At Kyaukpyu every native house has its cesspit. At Sandoway cesspits are in general use. At Rangoon the supply of water was insufficient. At Pegu a better water supply is much needed; cesspits are used in all native houses. At Prome "cesspools till exist and are regularly inspected. When either nearly full or offensive, these are closed and fresh ones opened. At Shwedaung the water supply was barely sufficient for all requirements. At Yandoon there was over 100 wells in the town, but only three yield water for drinking purposes. From the summary of the reports of the civil surgeons in Upper Burmah we learn some particulars of the sanitary condition of the towns in that portion of the province. At Mandalay the water supply is found to contain a large amount of minerals and organic matter. Cesspits still exist there, and in many other of these towns. At Bhamo the wells are unprotected and conservancy is very defective. At Mogaung parts of the town become waterlogged during the monsoon. Many like examples might be cited, but the above suffice to indicate the main kinds of danger to the public health, which are found in the towns of both Lower and Upper Burmah. From the consideration of the local reports and as the result of personal inspection, the general conclusions at which the Sanitary Commissioner has arrived are that in most municipal towns the drainage is very unsatisfactory, that the water supply is not satisfactory, that, although street conservancy is fairyl well carried out in all the large towns, much remains to be done in keeping the surface drains clean that more public latrines are wanted everywhere and also the general introduction of dust-bins.

9. *Sanitary Works.*—Many of the improvements urgently required are beset with difficulties, owing to the want of funds and other local circumstances, but it is important that the evils themselves should

not on this account be lost sight of, or thought lightly of in their influence on the production of disease. No marked progress was made in the removal of them during the year under report. No new sanitary works of any importance were executed in the province during the year, but Rs. 128,484 were expended by the Public Works Department in Lower Burmah, and Rs. 1,10,462 in Upper Burmah on what are grouped together as "sanitary works." In both, the main item is on account of hospitals, the rest was distributed on water supply, drainage, latrines, markets, and burial grounds. At Rangoon a considerable sum was expended on extending and improving the drainage works, and a large number of house connexions was established, both for drainage and water supply. At Prome, also, a number of private hydrants was added. In other places some of the cesspits had been closed, and other improvements effected in conservancy and drainage One great difficulty in dealing with existing evils has arisen from the want of a sanitary engineer to make a survey and advise what measures ought to be taken. It is very much to be desired that this most important post should be filled up as early as possible.

10. *Sanitary Board.*—No change was made in the constitution of the Sanitary Board, which consisted of a President, four members, and a Secretary. Their Annual Report for 1891 appears as an Appendix to the Sanitary Commissioners' Report. Pending the appointment of a special sanitary engineer, information had been called for regarding existing maps of municipalities, and the nature of the works which appeared to the local authorities to be best designed for improvements in drainage, water supply and conservancy. The two other most important points which engaged their attention were the framing of simple rules for village sanitation, and the introduction of a Bill to provide for this object. On both these questions the recommendations of the Board had been submitted to the Local Government.

27th June 1893.

No. 6.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Central Provinces for 1891.

Census of 1881 *still employed as basis of Statistics of Births and Deaths.*—The statistics of births and deaths for 1891 are unfortunately based on the Census figures of 1881. The figures of the Census of 1891 were not, it appears, available, and the only part of the Report in which they seem to have been used is that which refers to the towns. In the 21 Sadar towns named the population shown in the Census of 1881 was 393,519, whereas in 1891 it was recorded as 462,639. This large increase very materially affects the ratios which would thereby have been reduced for both births and deaths in 1891 by over 5 per 1,000. It is to be regretted, therefore, that the total population in districts, and for the province as a whole, could not be employed as the basis of all the calculations for the year. Further particulars must be awaited, not only as respect the more correct ratios for 1891 but also as regards the general bearing of the results of the two censuses on the number of births and deaths registered during the intermediate years—an inquiry of much importance which should be carried out both for each province as a whole and for its component districts and towns.

2. *Births.*—The births registered were more numerous than in any year since 1885, and yielded a ratio of 43·09 on the population of 1881. The districts, all of which show an increase over the year previous, return rates varying from a minimum of 35 in Saugor, to 54 in Nimar. In the first six districts which head the list in Table I. there was an excess of deaths over births amounting to from 1 to 5 per 1,000. In all the others the births exceeded the deaths, the excess ranging between 1 and 21 per 1,000, and the net result for the province as a whole is an increase of 7 per 1,000. No explanation is entered into as to the probable cause of the exceptional position of the first six districts, how far it is due to excess in the births or in the deaths. The mortality was very high in all of them except Saugor. The Sanitary Commissioner does not carry his comparison of the birth-rates beyond districts, but we would suggest that very valuable information might be obtained if the results in the registration circles were compared, and the maximum and minimum of such circles in each district were noted. The results would thus be more localised and afford a basis for their more satisfactory examination. Before leaving the question of births we may note that there is a remarkable similarity in the figures for the Central Provinces and those of the neighbouring Province of Berar, although the ratios for Berar are calculated on the population of 1891, and those for the Central Provinces, as already mentioned, on the Census of 1881. In both, the total birth-rate, the male and female birth-rate, and the proportion of males to female births are almost identical.

3. *Deaths.*—Owing in the main to cholera the deaths were more numerous than in 1890, the rate having risen from 32·52 to 35·54. The district ratios varied between 46 in Hoshungabad and 25 in Bilaspur. In the towns the ratio was 34 and in the country 35. The statement given in paragraph 15, where the rates, taken on the population of 1891 are compared with those on the figures of the Census of 1881, show that in many of the towns great changes have taken place, and that the ratios calculated on the old census are very misleading. In the town of Saugor, for example, the population has increased from 31,072 to 44,674, thereby reducing the births from 28 to 19 and the deaths from 27 to 18 per 1,000. In other instances, as at Hoshungabad, the population had decreased, and corrections have to be made in the other direction. An examination of the circle registration such as

we have already suggested under births would be equally, and, indeed, even more useful for dealing with the statistics of deaths, for in regard to them it is specially needful to ascertain as far as possible the localities where the death-rate is high, so that attention may be at once drawn to them with a view to ascertain, if possible, the cause or causes of the excessive mortality. A simple statement of the range observed in the death-rates among the registration circles of each district—the minimum and the maximum of each—would suffice. Much valuable information is now lost in district averages.

4. *Necessity of Inspecting the Registers.*—Nothing is said in this Report of any measures taken to improve the registration or births and deaths in the province beyond the infliction of fines in municipalities. We believe, as we have frequently urged, that much might be done by constant inspection of the registers, more especially in the country areas. If all officers who move about on tour were called upon to examine the registers, and to compare them with the verbal information they could easily obtain from the villagers regarding their domestic occurrences, not only would there be a certain amount of check on the entries but the people would gradually come to take an interest in the records from seeing that all officials took an interest in them also. District officers, police officers, education officers, could all render valuable assistance in this matter, and besides them there are the others more immediately connected with the health of the province, the Civil Surgeons and the Sanitary Commissioner's vaccination staff. We observe that in the Central Provinces in 1891, besides the 200 odd vaccinators whose work is immediately connected with births, and the 18 district superintendents who are, it is presumed, the civil surgeons, there are 25 Native superintendents who might be employed with great advantage in testing the registers, both of births and deaths, in the manner proposed. Perhaps this system is already carried out, but no mention is made of it in the Report. Some details as to what is actually done would be of interest, not only as regards the extent of inspection but also as regards what facts these inspections generally brought to light.

5. *General Character of the Year.*—The principal feature in the meteorology of the year was the delay in the monsoon, but though it came late, reducing the rainfall of June by 8·15 inches below the average, it was by no means deficient; on the contrary, it was considerably in excess all over the province. In only one or two districts did the people appear to have suffered from the high price of food. The civil surgeons' reports, which are abstracted by the Sanitary Commissioner, are generally favourable, but some of the statements they contain are not borne out by the mortuary statistics. For example, the Civil Surgeon of Bhandara says that "the health of the people was much better than during 1890." According to the statistics the death-rate rose from 29 in 1890 to 34 in 1891. In Raipur it is said that "the general health of the people was good," but the death-rate rose from 26 in 1890 to 31 in 1891. We are glad to see that orders have been issued by the Government of India requiring statistics of deaths, of meteorology, and of the prices of food grains for the year, as compared with those of the preceding five years in certain selected places. In the Central Provinces the places selected are the districts of Jubbulpore, Hoshungabad, Nagpur, Raipur, and Seoni, and the first statement with such information we have seen is contained in this Report.

6. *History of the Chief Diseases. Cholera.*—The year was one of considerable cholera prevalence, for the deaths under this head numbered 21,312, or 16,525 more than in 1890. The mortality equalled 2·42 per 1,000, compared with 0·54 in the year previous. The areas of comparative exemption and prevalence are shown on the cholera map, but the various shadings are not differentiated so clearly as they ought to be. The districts of Hoshungabad, Murwara, Nursinghpur, Damoh, and Jubbulpore, suffered most severely, the cholera death-rate in them ranging from 7·37 to 5·54 per 1,000. The districts of the Wainganga and Mahanaddi divisions suffered comparatively little. The highest rate in a town was 14 0 in the small town of Mohari in the Bhandara district. The extracts from the Civil Surgeon's Reports which are given in this chapter are chiefly taken up with an account of the manner in which the disease appeared to have been imported, and thereafter to have been spread by the sick to other places. The narratives generally are too vague to be of much value, and, what is of more importance, they do not afford a basis for any practical action. The importation theory is too apt to be readily accepted as a satisfactory explanation of a cholera epidemic. The disease was brought to the place and that is sufficient. But the remarkable contrasts between epidemic and non-epidemic years, the prevalence of the disease over certain well defined areas, and the comparative escape of others, the wide distribution of the epidemic over a province, and yet the small proportion of villages attacked, these and many other noteworthy facts that might be cited, all tend to show that the belief in importation affords but a very incomplete solution of the problem. In the Damoh district the Civil Surgeon reports that the disease having been imported it "spread throughout the district, and could "nearly always be traced from village to village and circle to circle by a direct and unbroken chain of "human agency." But this description hardly accords with the statistics which record that out of a total of 1,139 villages in this district only 207 suffered from cholera. Assuming, however, that the facts recorded are correct, and the opinions expressed warranted by these facts, what practical measures can be taken to carry them into action? Sanitary reports are of value only in so far as they lead to something being done to prevent disease. Is it possible, especially in a country like India, to isolate and disinfect the sick, and otherwise control the movements of the population so as to meet the dangers which are now supposed to arise from the want of such supervision, or would it not rather happen that the only result of any interference would be to cause great discontent, and induce among the people a decided aversion to everything in the shape of sanitation? The only practical measures that can be taken must be directed to searching out local defects and remedying them as far as possible, and to this end all reports, both from Civil Surgeons and the other sanitary authorities should be more especially directed.

7. *Small-pox and Vaccination.*—The mortality due to small-pox was less than had ever been previously recorded. The deaths numbered 748, or a ratio of 0·08 per 1,000. The highest ratio in a district was ·27 in Bhandara. In the towns which suffered most the disease was confined to a few deaths, and in many of them no death from small-pox was recorded. These results are so far very satisfactory, and indicative of the success of vaccination. The operations of the Vaccination Department for 1891–92, which form the subject of a separate report, continued to be actively carried on. There was an increase in the total number of operations, and also in the number of successful primary operations. The percentage of success in primary cases was 96·5, and in re-vaccinations 79·48. This last figure calls for some explanation, as it points either to some error in the statistics or to some imperfection in former primary operations. In the neighbouring province of Berar the success claimed for re-vaccinations is 29·4, and this is much more what the ratio ought to be than the Return for the Central Provinces. It appears from the Report that the facts recorded were tested in a large extent by actual inspection, and in the main verified.

8. *Fevers.*—Of the total mortality of 35·54, fevers contributed 21·61, but the proportion varied greatly in different districts, from 8 in Sambalpur to 35 in Nimar. From the figures contained in one of the columns of the sanitary estimate it appears that if taken by registration circles the differences are even more marked, between 7 in one circle and 67 in another. "Fevers" is doubtless a very vague term, and apt to be differently interpreted in different places, but no greater accuracy can be arrived at with existing machinery. In paragraph 41 a table is given containing the result of inquiries made by civil surgeons into the causes of deaths with a view to ascertain what proportion was due to *fevers, dysentery and diarrhœa, chest affections,* and *other causes.* The proportions vary considerably in different places, as was to be expected, but the average of the whole shows that of every 100 deaths 41 were probably due to fevers. It is not explained how the inquiry was conducted nor how the police, who also collected statistics on the subject, were able to make an investigation of this kind. The results of their inquiries are tabulated side by side with those of the Civil Surgeons, and yield a fever mortality of 53 per cent. of the whole deaths. No comment is made on this table by the Sanitary Commissioner, and some further explanation and information would be of interest. The proportion of the total mortality shown in the general mortuary statistics which is set down to *fevers* is over 60 per cent., a proportion greater than that deduced either by the Civil Surgeons or the police.

9. *Sanitary Defects.*—As was to be anticipated in a year of cholera prevalence the death-rate from dysentery and diarrhœa was higher than in 1890, when cholera was comparatively in abeyance. We find accordingly that in 1891 the greatest mortality from dysentery and diarrhœa was, as a rule, recorded in those districts which suffered most from cholera. In the sanitary estimate, page 25, we find numerous instances of excessive mortality under dysentery and diarrhœa, amounting to 6, 7, and even 8 per 1,000. This estimate is designed to show side by side the death-rates caused in each circle of registration by the principal diseases, and the sanitary condition of each of these localities, but as we have before observed it would be more complete if cholera were shown in a separate column, and also the total death-rate from all causes. This statement, if further developed and carefully filled up, is indeed a most important part of the Report; we may, indeed, say the most important, because it would then point at a glance to the places where reforms in local conditions are most urgently required, and record year by year what progress was being made in remedying defects. As the statement now stands in this Report for 1891 it is very incomplete. From 40 towns, including many of the most important in the province, no information whatever is given as to the condition of their drainage, water supply, or domestic cleaning, for opposite them it is said "estimate not furnished." But meagre as the statement is, it yet supplies abundant evidence that in many places there are grave defects under all the three heads under which their condition is described. The total number of circles shown in the statement does not appear to agree with the total given in General Tables VII. to X.

10. *Sanitary Works.*—Of actual sanitary work done during the year the following may be noted:—The excavation of part of the tank at Saugor at a cost of Rs. 2,000, the acquisition of land round the reservoir at Jubbulpore, towards which Rs. 17,716 were paid; at Betul a large tank had been deepened and cleaned; at Nagpur the works for extending the water supply to the civil station and higher parts of the city were completed. At Raipur it is said that "a waterworks scheme has been "matured and is being rapidly carried out." In addition to the above a number of wells have been constructed and repaired throughout the province. Further, a survey was made of the towns of Jubbulpore and Nagpur with a view to the preparation of a drainage scheme. The Village Sanitation Act has been extended to 40 villages of which 33 are in the Nimar district, and in respect of some of these schemes of sanitary reform had been sanctioned. Particulars of these schemes are not given, but it appears from the orders of the Chief Commissioner that in most cases "all that can be done at present is to provide new wells or improve existing ones."

11. *The Sanitary Board.*—Some important changes were made both in the constitution and powers of the Sanitary Board. In addition to the Sanitary Commissioner and to the Superintending Engineer, the Commissioner of the division, the Deputy Commissioner, and the Civil Surgeons, are members within the limits of their respective jurisdictions. The Board was chiefly occupied in considering and giving practical effect to a scheme of village sanitary improvement which was ordered by the Chief Commissioner in October 1891, and also in a further resolution, dated the 27th November. The Chief Commissioner expresses his disappointment with the working of the Board, more especially as to the want of information concerning the actual sanitary work done. It is noted that for the year 1892–93 Rs. 50,000 have been placed at the disposal of the Board for such work, and it is hoped

that, aided by local labour and materials which practically make the total grant equal to about two lacs of rupees, decided progress may be made.

12. *Scheme of Rural Sanitation.*—The orders of the Chief Commissioner above referred to are very important. The objects aimed at and the procedure to be adopted are thus summarised: "(1) grouping of the villages of a district into rural sanitary circles of convenient size; (2) investiga- "tion, by experts, into the sanitary conditions of each circle with special reference to water supply, "conservancy, and drainage, and submission of proposals for improvement; (3) collation of such "proposals with information derived from the district executive authorities as to financial condition "of village, &c.; (4) submission to and consideration by the Sanitary Board of such proposals and "other relevant information and orders by the Board as to sanitary works to be done with distribution "of available funds; (5) issue by the district executive to the village authorities, panchayet, or "mukaddams, of the Sanitary Board's orders and enforcement of the same." As a first step the registration circles are to be reduced in size so as to include twenty adjacent villages (no circle to contain more than thirty), and within these the registration of vital statistics is to be supervised and watched so that any excessive mortality may at once direct attention to the condition of the locality. Four Assistant Surgeons were to be appointed sanitary inspectors, one for each division who would report on the state of the villages in their respective divisions. Inspection would also be made by district officials, the police, tahsildars, &c., and all these reports collated and examined by the Civil Surgeon, whose duty it would be to submit the results to the Sanitary Board. In this way the Civil Surgeon would become in reality what he has been hitherto only in name, the chief sanitary officer of the district. The Board will then issue orders as to the work to be done and apportion the funds available. It is recognised that the funds of the District Councils are insufficient in themselves, and of the Rs. 50,000 available in 1892–93 Rs. 20,000 were to fall on Provincial Revenues. The scheme, it is pointed out, has this advantage, that "it may be restricted in its operation to a few villages and yet "admit of expansion to the entire Province without losing its simplicity or changing its aim or "procedure." We have noted the provisions of the scheme in some detail, because it is a comprehensive attempt to deal with the most difficult of all the difficult problems of sanitation in India—the improvement of the villages. We shall watch the results with much interest. It would have strengthened the Board very materially if it could have been aided by special sanitary engineering skill, for, although the works contemplated are only to be simple and such as can be constructed by common village labour, much of the success desired depends on the adoption of a proper scheme of improvement at the commencement suited to the particular wants of each place. We are well aware, however, that the addition of a Sanitary Engineer to the Board would have materially added to the cost, and sufficient funds do not seem to be available. Under the new scheme the importance and responsibility of the Sanitary Commissioner of the Central Provinces are very largely increased.

27th June 1893.

No. 7.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of ASSAM for the year 1891.

1. *Registration of Vital Statistics. Births.*—The registration of vital statistics in this province continued to be in a very backward state during 1891. The birth-rate according to it was only 28·59, which even shows a falling off from 30·56, the ratio in 1890, and, judging from the experience of all those other parts of India, the records of which bear evidence of greater accuracy, both these ratios probably fall much short of the actual fact. The diminution of the birth-rate in 1891, as compared with 1890, however, does not arise from any diminution in the actual number of births registered. On the contrary, the number of births registered in 1891 was 143,548, whereas the number in 1890 was only 138,326. The lower ratio is due to the fact that the rate for 1890 was calculated on the Census of 1881, whereas the rate for 1891 is calculated on the larger population shown by the census of that year. The details given for districts as usual yield very different results. The district ratios fluctuate between 21 and 34; the proportion of male births to every 100 female births varies from 104 to 113, and in six out of the total of nine districts we find the birth-rate exceeded by the death-rate, so that, for the provinces as a whole, during 1891, this excess of deaths averaged 1·32 per 1,000. The figures, so far as they are given, all point to deficiency in the birth registrations as the probable explanation of these results, but it is very desirable, with a view to forming correct conclusions on this and other points concerning the vital statistics, that there should be a more complete examination of the details, and this can only be done by taking the circles of registration in each district and showing how the average of this district in composed. Is it made up of great extremes, or does a similar rate prevail, with only occasional and slight variations? If the extremes are marked, then some enquiry is evidently required as to the cause to which this is to be ascribed, whether carelessness or inaccuracy in the registration, or, it may be, to some disproportion in the sexes not infrequent in some Indian towns, whereby the birth rate is necessarily below the ordinary standard. In Assam we observe that there are 632 circles of registration, the number in each district varying between 15 in Cachar and 159 in Sibsagar. The examination of all these details would, no doubt, involve considerable work, but it is work in which the local authorities of each district might render much assistance, and it is very necessary, if registration is to attain any accuracy, that the importance of the registration circle as the unit, the statistics of which require careful examination, should be fully recognized:

2. *Deaths.*—These remarks have been made with reference to births, but they apply with even greater force to deaths. In respect of them the average for a province or a district is of comparatively little use. It is essential to deal with individual localities, and to ascertain in what way high death-rates are associated with causes of disease in particular places. The number of deaths recorded in Assam in 1891 was 150,156, or a ratio of 29·91, whereas in 1890 the number, 134,195, yielded very much the same ratio, 29·64, a discrepancy which, as in the case of the births, is to be explained by the differences in the censuses on which the calculations are based. The chief facts in the distribution of the mortality are that in the Surma valley there was a large increase, while in the valley of the Brahmaputra there was some diminution. The district ratios vary from 19 in Sibsagar to 35 in Goalpara and Darrang. The variations in the relative male and female mortality are indications of imperfect registration. The average for the province is 112 males to every 100 females, but this includes extremes of 106 in Goalpara and 130 in Kamrup. The results in the towns is particularly disappointing. In the nine *sadr* towns, in which it appears that registration is compulsory, the death-rate varies from 14 to 54 per 1,000. This alone would not suffice to prove negligence, because in Indian communities the mortality varies greatly in different years, but where we have at the same time, as we have here in these *sadr* towns, birth-rates of all grades between 3 and 35 per 1,000, no further evidence is needed to show that the records are altogether untrustworthy. The same may be said in a minor degree of the statistics of the 11 subdivisional towns, where also registration is supposed to be compulsory.

3. *Improvement of the Registration.*—Both the Sanitary Commissioner and the Local Government are fully alive to the serious defects in registration of births and deaths. In the orders on this Report for 1891, the Chief Commissioner draws particular attention to the great neglect of registration, especially in the towns. He refers to the orders on the subject of registration generally which had been issued previously, and which, so far, had produced such little results, and again enjoins greater attention to this important matter. "Both the Sanitray Commissioner and the Commissioner "of the Assam valley districts," he adds, "should during their tours of inspection make special "inquiries in regard to the steps taken to secure accurate registration of vital statistics in compulsory "areas, the Sanitary Commissioner giving the result of his inquiries in his annual report, with any "suggestions which he may have to offer for improving the system of registration he finds in force "in each district." The Sanitary Commissioner has already endorsed a proposal made by the Inspector General of Police that his officers and higher subordinates should when on tour inquire into the number of births and deaths recorded, so that they may be compared with the entries in the register. It is very desirable that these entries should be checked and compared with the information obtained on the spot, not only by police officers, but also, as far as possible, by all other officers on their tours of inspection. It does not appear how far the civil surgeons and the vaccination staff have yet aided in the important work of inspection, where their aid might be of special value, not only in improving the statistics but also in examining the local conditions associated with any excessive mortality. Another measure directed towards improved registration, which we have already suggested, is the careful examination by the Sanitary Commissioner in his annual report of the extremes of both birth and death rates returned by the registration circles of each district. Without such an examination of the individual units of registration, it is not possible to determine where the sources of error lie.

4. *The Census of* 1891.—The vital statistics of 1891, as has been already mentioned, are calculated on the census population of that year. It appears that during the ten years since the previous census was taken the population had increased by 494,125, and an examination of the figures in the Report for 1890, which are based on the Census of 1881, shows that the increase was general over the different parts of the province. The Sanitary Commissioner has not discussed how far the Census of 1891 agrees with the records of births and deaths and their results on the Census of 1891, and it is very desirable that this should be done, not only by districts, but also for all principal towns. A few of the other census figures would also be of interest in a sanitary report, such as the proportion of the sexes and the proportion of young children in different communities. The discussion of these and other matters probably awaited the full completion of the Census Report.

5. *Mortality from Different Causes.*—Before considering the history of some of the chief diseases in Assam during 1891, we may glance at a very interesting table which the Sanitary Commissioner gives at the top of paragraph 13, and in which he contrasts the number of deaths under all recorded heads in 1891 with the number under the same heads in 1890. We have added the ratios under each for 1891, as they will be useful for subsequent reference, but the actual numbers, owing to the difference in the census figures, form the best basis for comparison.

Causes of Death.	Number of Deaths.		Ratio per 1,000 in 1891.
	1890.	1891.	
Cholera	153,396	23,882	4·76
Small-pox	1,401	2,361	·47
Fevers	74,779	75,965	15·13
Dysentery and Diarrhœa	13,015	14,418	2·87
Injuries	1,729	1,597	·32
Other causes	27,875	31,933	6·36
All Causes	134,195	150,156	29 91

It is remarkable that under every disease there is a decided increase in the deaths, but more especially under cholera, small-pox, and that very extensive group which is embraced under the general head of "all other causes." The general unhealthiness of the year, the Sanitary Commissioner believes, manifested itself chiefly in the direction of cholera and *kala-azar*, and the increased mortality recorded under dysentery and diarrhœa he would ascribe to these two diseases, in both of which such symptoms are prominent.

6. *History of the Chief Diseases: Cholera.*—Cholera was extremely prevalent. The mortality it occasioned was greater in 1891 than that recorded in any previous years. For the province as a whole the death-rate under this head was 4·76; for the Surma Valley separately 4·33, and for the Brahmaputra valley 5·29. Both the districts of the former valley, Cachar and Sylhet, suffered severely. In the latter valley the disease prevailed with very different intensity, for, whereas four of the districts returned cholera deaths in proportions varying from 4 to 11 per 1,000, in the remaining two the ratio was under 2 per 1,000. Of all the towns, Silchar suffered most, the deaths from cholera in it having exceeded 16 per 1,000. A statement is given for each district which shows very clearly the incidence of the disease both by locality and season. We have already seen how much more severely certain districts were affected by cholera than others, and from these statements we learn how, even in the same district, certain parts suffered much while others either escaped altogether or suffered but slightly. In the Darrang district, for example, where the maximum mortality from cholera (11·49) occurred, 49 out of the total of 54 registration circles returned deaths from cholera, but these were limited to 335 out of a total of 1,674 villages. While avoiding any positive assertions on the very difficult question of the share of human intercourse in the propagation of cholera, the Sanitary Commissioner seems inclined to attribute the disease to importation, and to ascribe its great prevalence in 1891 to two unusual events. One of these was a special festival in Bengal, which had recurred after 30 years, and to which many pilgrims went and returned thence both to the Surma and Brahmaputra valleys suffering from cholera. The other was the Manipur expedition, which brought a great influx of people from India, among whom cholera was very prevalent. The facts are not given with sufficient precision to warrant any decided conclusions being drawn from them, but, so far as the pilgrims are concerned, there seems good ground for believing that they were not the means of distributing the cholera, but merely victims of the prevailing epidemic. For example, the Civil Surgeon of Goalpara reports, "The great festival of Ardhoday took place in February 1891. This "festival was a special one, as it was last observed about 30 years ago. For this festival all who could manage it went to Calcutta or to Murshidabad to bathe in the Ganges. The pilgrims returning came back with cholera. Every steamer arriving here (at Dhubri) had cholera-stricken pilgrims on board. This evidence reads strongly in favour of the pilgrim theory of dissemination, but if we turn to the statistics of cholera month by month we find that in January, the month before the festival, cholera had caused 998 deaths in the province; of these, 902 occurred in the Surma valley, and it is worthy of notice that in February, when the returning pilgrims had come back, the number of such deaths was less than it had been in January (only 680). In the Assam portion of the province, in the same way, cholera had appeared long before the pilgrims had returned. It caused 96 deaths in January. Of the six districts in this Assam valley, five contributed to this total, though the contribution of all of them was very small, excepting Kamrup and Darrang. It is deserving of notice that in Kamrup, just as in Sylhet, the cholera deaths of January *before* the pilgrims could have returned were more numerous than they were in February, when these are supposed to have imported the disease. Whatever opinions may be entertained on the question of human intercourse, we entirely concur with the Sanitary Commissioner in his opinion as to the great importance of sanitary improvements as the great, and we believe the only efficient, means of preventing cholera. "I find," he says, "that wherever "sanitation has not been brought into practice and use, there cholera, when it appears, has a greater "and more serious incidence," and under this general head of sanitation he, very properly, includes not only pure drinking water, but also good conservancy, good food, and good drainage.

7. *Small-pox and Vaccination.*—According to the statistics which are contained in the separate report on vaccination, the special work of this Department has made great strides during recent years. In 1882–83 the total number of persons operated on in the province was only 57,619, in 1891–92 it was 197,572. In the first of these years the number of successful cases was only 51,516, whereas in the last it had risen to 184,225. This is a most satisfactory advance, especially as it has been steady and unchecked from year to year. In 1891–92 the results in many other respects are also good. The percentage of success in primary cases was high, and a large number of young children were protected. These results, moreover, were, to a large extent, verified by actual inspection on the part of the Civil Surgeons and their subordinates. But, although so much progress has been made, a comparison of the number of infants protected with the number of births during the year shows how much still remains to be accomplished before the Vaccination Department can expect to exercise efficient control over small-pox. In 1891 the number of births registered was 143,548, and this number was, as already shown, in all probability much below the truth. The number of infants under one year who were successfully vaccinated in 1891–92 by the vaccination and dispensary staffs combined was only 22,256. Under these circumstances, it is not surprising that no very decided evidence is forthcoming of the influence of vaccination in preventing small-pox. The Sanitary Report for 1891 shows that the year was one in which small-pox manifested considerable activity, the deaths from that cause having been 960 in excess of the number for 1890. The increase was not confined to one part of the province, but was very generally distributed. The statistics which are supplied at page 15 are the district deaths from small-pox in 1891 and 1890, but for the preceding five years 1885–89 the annual average only is given. With a disease such as small-pox, which has its periods of decided rise and fall, the actual deaths of each year would be more useful for comparison.

8. *Fevers and Kala-azar.*—The number of deaths recorded under fevers was greater than in the year previous, 75,965 against 74,779, but, owing to the introduction of the new census figures, the ratio of mortality is less, 15·13 against 16·52. The increased number of deaths was almost entirely confined to the Surma valley; in every district of Assam proper the number was somewhat less than in the year previous. But in both years the lower portions of Assam proper suffered much more severely from fevers than those of the Surma valley. Goalpara returns 26 deaths per 1,000 from this cause, Kamrup 21, and Darrang 15. In the Surma valley the average was 13. The extremes in the fever death-rates may be seen in annual form No. VI., where the district rates range between 7 and 26, and the town rates between 4 and 46, extremes which it is to be feared are in great measure due to imperfect registration. The Sanitary Commissioner again recurs to the increasing deaths in the province recorded under fevers, and this he attributes at least in part to the advance of *kala-azar*, the special disease which has been the subject of much comment in recent Assam Sanitary Reports. In 1891 some attempt was made to separate this disease as a cause of death from the other fevers with which it has been hitherto returned, and the result has been that 9,937 fatal cases of this disease have been registered. Much interesting information is given in this report regarding *kala-azar*, commencing with the time when it first attracted attention. The Sanitary Commissioner is of opinion that it is a new disease in the province; that it was probably imported from some neighbouring Bengal district; that it is steadily advancing, the medium of its spread being the *dochmius* or *anchylostomum* parasite, which is regarded as its distinctive feature; that in respect of this parasite it is the same disease as the *beri beri* of Ceylon, but that there is in *kala-azar* "the additional element of intense malarial poisoning." These main conclusions were summarized in our Memorandum on the Assam Sanitary Report for 1890, as well as the practical measures for carrying out improvements in water supply and other sanitary requisites for the prevention of this disease, in all of which we concur, and we should be glad to know how far they have been actually carried out, a matter on which information is deficient. It is now proposed apparently to exercise a more strict supervision on coolies entering the province. A number have been rejected, and the Sanitary Commissioner has "submitted to the Chief Commissioner full details of such rejections, including the districts from "which they were recruited, with a view to measures being taken to put a stop to the admission into "gardens in this province of such coolies who come from the recruiting districts so evidently infected "with *anchylostomiasis.*" These remarks have been communicated by the Chief Commissioner to the Local Governments concerned, "with a view to the adoption of any preventive measures which may be possible." We much fear that any such measures must fail in the desired object, while, no doubt, their introduction will offer a new obstacle to the importation of labour into the province. If the presence of the parasite were a diagnostic sign of ill-health, the case would be different, though it would still be attended with great practical difficulties. But it would appear that the parasite is to be found in many persons who are to all intents and purposes healthy. Dr. Dobson, we are told, in the Gauhati jail, "found this parasite in a large proportion of prisoners who were to all appearance perfectly healthy;" 104 healthy looking coolies showed 65 per cent. of such infection. Dr. Dobson "also found that *anchylostoma* can be discovered (generally a few in each case) in over 31 per cent. "of the chuprasies, peons, and topazes who accompany the coolies to Dhubri, those chuprasies, &c., "being generally healthy persons." It is very desirable that full inquiry should be made on every point concerning this very fatal disease known under the name of *kala-azar*, and one of the most important of these points is to ascertain what is its history in Rungpore or any other district from which it is believed to be imported into Assam. Does it exist there under the same or similar aspect to that observed in Assam? Is it equally fatal? Is there any evidence that it has spread or that it is spreading in those parts? Is the peculiar parasite to be found among the people there, and, if so, how far is its presence compatible with health? In what proportion is it found in a person apparently healthy compared with the proportion in which it is found in a person unmistakeably suffering from *kala-azar?* Much will depend on the result of these and the many other local inquiries which such an investigation would suggest, but we are inclined to believe, so far as the facts now stand, that too much importance has been attached to the parasite, that its presence has been too hastily assumed to be the *cause* of the disease, whereas it may yet be proved to be a consequence, or merely an accompaniment of it. In order to account for the frequency with which the parasite is found among persons apparently in excellent health, and especially among those entering the province of Assam for the first time, the Sanitary Commissioner says: "My opinion is "that the health of the subject of the *anchylostomiasis* is not affected until the parasite has "sufficiently increased in numbers from fresh infections after arrival in Assam, or from reduction of "the vital powers from overwork, insufficient food, sickness, &c., in a new climate." The last clause would seem to point to the real explanation of the facts. The existence of the parasite in the human body seems quite compatible with health, but when exposed to unhealthy influences the vital powers are lowered, the parasite, as one of the signs of these failing powers, increases, and other symptoms, such as enlarged spleen, anœmia, &c., also set in. Whatever may ultimately be decided on this point, we are fully persuaded that the best practical method of dealing with this very important matter does not consist in attempts directed to prevent the importation of the parasite, which, under the circumstances, could never be successful, but in the improvement of the local conditions under which the people live.

9. *Sanitary Defects.*—As a first step towards such improvment, it is necessary that the existing defects should be pointed out, and in such information this report is deficient. At page 49 a statement is given in which columns are provided for a description of the water supply, drainage, and conservancy, with other columns for the population and death-rates. The statement is good so far as it goes, but it refers to only 23 towns or stations of the province. There is no general

"sanitary estimate" for towns and villages and villages also, such as appears in most of the other Sanitary Reports. Some of the 23 places named return a very heavy death-rate, and defects, especially regarding the water supply, are frequently noted, but in regard to some of these more particulars are desirable. For example, the water-supply of Haila-Kandi is pronounced to be "bad," and that of Dhubri "good." A concise account of the source of supply and any dangers to which it is exposed would be useful for practical purposes. In the chapter which deals with civil sanitary works, and in which a short *resumé* is given of the income and expenditure of each municipality, incidental mention is made of some sanitary defects, such as the dangerous position of the night-soil burying ground at Sylhet in relation to the Surma river, the numerous filthy tanks at this place, which are also dangerous as a source of supply, and the want of proper conservancy as regards the private latrines.

10. *Sanitary Works.*—Mention is made in Chapter X. of certain minor improvements which had been effected in some of the municipalities during the year. No work of any magnitude was executed, but, as may be seen from Column 9 of the statement at page 49 of the Report, many recommendations and suggestions were made by the Sanitary Commissioner as the result of his inspecting municipalities. In reviewing this part of the sanitary work of the year, it is gratifying to note that, in the opinion of the Chief Commissioner, "on the whole progress is being made in "municipalities, stations, unions, and towns in carrying out sanitary improvements," and that he "was satisfied that municipal commissioners, station committees, and district and subdivisional "magistrates were doing all in their power, with the funds at their disposal, to carry out "suggestions." The Chief Commissioner attaches first importance to a good water supply, and the attention of the local authorities has been drawn to the necessity, in the interests of the public health, for providing wells in place of tanks, and protecting them as far as possible from all sources of pollution. The state of the finances unfortunately compels the province to be contented for the present with small endeavours, and more ambitious schemes must lie over until the necessary funds are available. In the meantime, however, much may be done by simple means directed to ensuring greater cleanliness in every way, and by making sure that money is not being spent on any schemes of improving the public health except such as, beyond all doubt, are certain to be of use.

11. *Sanitary Board.*—The proceedings of the Sanitary Board of the province are shortly summarized in Appendix B, at page 48. The Board consists of the Sanitary Commissioner, the Secretary to the Chief Commissioner in the General and the Secretary in the Public Works Department, with the Assistant Secretary to the Chief Commissioner in the General Department as Secretary. The Civil Surgeon of Shillong was also a member. The objects aimed at may be said to have been generally the improvement of the water supply of villages, of their drainage, and their conservancy. So far their work seems to have been mainly that of suggestion and recommendation.

27th June 1893.

No. 8.

MEMORANDUM by the ARMY SANITARY COMMISSION on the RAJPUTANA SANITARY, VACCINATION, DISPENSARY, and JAIL REPORT for 1891.

1.—*Registration of Births.*—The principal events of the year are concisely set forth in the introductory note by the Agent to the Governor-General. We do not propose to repeat them, or to enter into a lengthened review of this Report. The remarks we made in the Report for 1890 apply in great measure to this Report also, and we shall therefore confine ourselves to a few practical points which deserve attention. Among these, the first that claims notice is the registration of births and deaths. This important work seems to make very little progress towards accuracy. To begin with the births. Out of a population of 542,358, according to the Census of 1891, only 11,566 births were recorded, or a ratio of only 21·32 per 1,000. About one-half of the actual deaths must be omitted altogether. The imperfection of the statistics is evident, not only from the average low ratio, but also from the details of which this average is made up. The rate in the 23 different places named in Annual Form No. 1 varies from 10·75 to 76·85. This last extraordinarily high rate is returned by the Ajmere suburbs, and it is worthy of notice that one of the lowest rates (11·50) is returned by Ajmere town. Then, again, the great preponderance of male to female births is itself proof of great negligence in the registration. For Ajmere and Merwara districts, to which the figures we are now quoting refer, the average preponderance is 124 male to every 100 female births, but many of the places named show a preponderance far in excess of this, reaching a maximum in the town of Nyanagar of 162 male to every 100 female births. When the results within British territory are so unsatisfactory, it is not surprising that those in Native States are no better than they are. Among them, we have a general birth-rate of 19·63, not far short of the rate for Ajmere and Merwara, but this general rate is made up of local rates varying between 4·83 and 67·63. The difficulties of securing an accurate or even an approximately accurate record of births, especially in Native States, must be very great, but more might be done to obtain more accurate results within British territory. It is not explained what system of registration is adopted, nor what measures are taken to inspect the current records. Without some system of check and inspection little improvement can be expected.

2. *Registration of Deaths.*—Similar remarks apply to the registration of deaths. In Ajmere and Merwara a general rate is recorded of 20·23 per 1,000, but this general rate is the outcome of local rates varying from 8·92 to 77·51. Mortality in India, no doubt, fluctuates greatly in different years and different places, but such extremes seem hardly credible. The excessive ratio of 77·51, we observe, comes from Ajmere suburbs. Was any local inquiry made to test the truth of this startling death-rate, or to point out the error, if error it proved to be? Again, the statistics of Ajmere and Merwara furnish general statistics of the deaths of 123 males to every 100 females. This is in itself an unexpected result, but the contrast between the male and female mortality in many places is even more striking than this, and particularly in the Ajmere suburbs, where the male mortality is entered as 64·18 and the female mortality as 105·45. We would suggest that in the case of such abnormal results local inquiry should be made and the results explained in the Report. The statistics of deaths in the Native States affords examples of similar extremes in the mortality. The lowest rate, 9·13, was recorded in the Jhallawar State, and the highest, 50·29, in the city of Dholpur. In the Native States the deaths are distributed under the great heads of Cholera, Small-pox, &c., but there is no division according to age or among rural tracts in contradistinction to towns. The information on these points which the statistics of Ajmere and Merwara supply show a general death-rate of 26·39 in the towns compared with only 18·51 in the districts. In regard to deaths among infants, which form such a large part of Indian mortality, the rate in Ajmere and Merwara is below that of every other province, and much below that of most of them. For male infants under one year it appears as 126, and for females as only 102. In the other provinces the male rate varies between 141 and 397, and the female rate between 101 and 340. In the town of Madras during 1891 the mortality of infants of both sexes under one year of age is returned at the extraordinarily high ratio of 427·5 per 1,000. The statistics of deaths according to age are specially open to error, but there can be little doubt that the infant mortality is a matter which specially demands inquiry.

3. *History of the Chief Diseases: Cholera.*—The year was very unhealthy. The rainfall was much below the average, and this, following on the scant fall of the year previous, caused a want of fodder. The cattle died in large numbers, and there was widespread distress in Ajmere-Merwara. The year was further characterized by an epidemic of cholera, which was, in some parts of the country, severe and prolonged. In Ajmere-Merwara the cholera deaths, which amounted in 1889 to 55 and in 1890 to 408, reached in 1891 a total of 532, but it is worthy of notice that the disease was entirely confined to the northern and central divisions of Ajmere. In the southern and south-eastern divisions of Ajmere and also in Merwara not a single death from cholera was reported. In the Native States the cholera mortality in 1891 was little more than it had been in the year previous, 2,414 deaths in 1891 compared with 2,338 in 1890. Seven of the Native States seem to have escaped altogether. As we remarked in our Memorandum on the Rajputana Report for 1890, a cholera map would be of great assistance for the better understanding of the events of each year, and we trust that this want may be supplied in future reports. We have examined the details of Table No. VII. in order to see if some of the excessive death-rates already referred to in Ajmere-Merwara were due to cholera, but no single place seems to have suffered in any great degree. The highest cholera death-rate is 7·09 in the rural circle of Goella, and in the suburbs of Ajmere, with a total of 77·51, only 4·28 was ascribed to cholera. The chief part is entered under the head of fevers. It is of interest to note that the Merwara battalion at Ajmere remained free of the disease, and also the jail, although prisoners to the number of 448 were sent in from parts of the district where cholera was prevalent. More information is desired regarding the sanitary condition of the towns and rural circles which suffered most.

4. *Smallpox and Vaccination.*—During 1891, 561 deaths from smallpox were registered in Ajmere-Merwara and 426 in the Native States. In Ajmere-Merwara, Ajmere town and suburbs suffered more than any other places, the smallpox mortality in the one being 4·87, and in the other no less than 8·39, a disappointing result at the head-quarters of the division. Vaccination continued to make progress. In Ajmere-Merwara the total number of successful primary operations was 12,703, and in the Native States 228,164. In both primary operations and in re-vaccinations the amount of success attained was great. For Ajmere-Merwara it averaged 98 for one and 94 for the other. This last ratio was suspiciously high, but great care has been taken to verify the Returns. Vaccination Statement No. 1 fills up the columns showing the "average annual number of persons "successfully vaccinated during the previous five years, and the ratio per 1,000 of the population," for Ajmere-Merwara as a whole. A more detailed statement would be useful. It is important to show such results place by place, so as to compare the history of smallpox in each with the work of the vaccinators.

5. *Sanitary Works and Progress.*—In the Ajmere Division important steps had been taken to improve the sanitary condition of the town of Ajmere. The prolonged anxiety regarding the water supply which had attended the drought of 1890 and 1891, and the impossibility of supplying the much-felt want of water by wells, has led to the carrying out of a scheme under which a supply is pumped into the city from a lake five miles distant. The result is reported to have been successful, but, in order to make it still more secure, another reservoir was being constructed at a higher level than the town, in which some of the water which has hitherto flowed on into the Anasagar lake will be intercepted, and from which it will flow on to the city without the aid of pumping. In addition to this great improvement, from which much increase to the health and comfort of the people may be anticipated, other measures of a minor character have been adopted in the interests of the public health, chiefly connected with the better disposal of the sewage both of the town and the neighbouring small fortress of Taragarh. In the Native States, although there are no great works to be spoken of, there is decided evidence of progress. In the Ulwar State the important question of village sanitation

has been taken up by the Durbar, and local municipal committees have been established, whose aim will be to improve the sanitary condition of the villages within their respective jurisdictions. The Chief Medical Officer, Brigade Surgeon Lieutenant-Colonel Spencer, by whom this Report has been drawn up, and who has had long experience of Rajputana, we are glad to see, writes very hopefully on the position and prospects of sanitary work in this part of India. "It appears, then," he says, "that "instead of sanitation being regarded as merely a curious and unpleasant European hobby, it is now "in several States looked upon as a subject of some importance, and though the progress made in "the endeavour to change immemorial customs must be slow, there seems no reason, if patience and "tact be exercised, why the benefits to be derived from obeying the laws of health should not be "more widely appreciated year by year."

6. *Jails.*—In the Ajmere Division there is only the one jail, at Ajmere. Here the results were not so favourable as in the year previous, for the mortality rose from 7·83 in 1890 to 27 in 1891, the expression of three deaths in the one year and 11 in the other. In individual jails, especially where, as in this instance, the number of prisoners is not large (about 400), annual fluctuations are to be expected altogether apart from local conditions. We observe, however, that there had been some overcrowding, which, no doubt, acted prejudicially. Steps were being taken to obviate this evil. The 14 Native States which furnished returns include an average population of 4,480 prisoners, and among them the death-rate was 33·70, which, though higher than that of Ajmere, was considerably under the general rate for the Native State jails in 1890. But, although these figures represent the average of all the Native State jails taken together, they are the outcome of very different experience in individual places. We find, in fact, from paragraph 124 of the Report, that the mortality varied between 7 and 108 per 1,000. It would be an advantage if the statistics of all the jails were given in tabular form one by one, so that the results might be more conveniently compared. We note that in many of the State jails important improvements were being carried out, and that, in particular, measures were in progress to prevent overcrowding. Such a record is very satisfactory.

18th July 1893.

No. 9.

Memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of Coorg for 1891.

1. *Census of* 1891.—The tables of vital statistics show that the population of Coorg, according to the Census of 1891, was 173,055, or less by 5,247 than it had been at the previous Census of 1881. The Civil Surgeon of Coorg, who has prepared the Report, has made no reference to the census, or to any of the many interesting points connected with it which have such a direct bearing on the sanitary condition of the people, and on the statistics both of births and deaths. Nor has any attempt been made to compare the population as disclosed by the Census of 1891, with the figures to be obtained by adding all the births registered during the ten years to the population of 1881, and deducting all the deaths. In addition to the diminution of population shown by the Census of 1891, another feature in the results deserving of notice is the excess of males over females. Of the total of 173,055, 95,907 were males, and only 77,148 females.

2. *Registration of Births and Deaths.*—Some little advance seems to have been made in the registration of vital statistics. The births which in 1890 equalled only 15·25 per 1,000, in 1891 rose to 20·31, which is a nearer approximation to the truth, but the deaths recorded, even at the low ratio of 21·19, exceeded the births. In regard to registration, we would call attention to the suggestions for its improvement which were made last year in our Memorandum on the Coorg Report for 1890, to the effect, that in the tables each of the six registration circles should be entered separately, and the results shown for each of them, as well as for the province as a whole. In Table VI., also, the municipal towns should appear. We need not repeat what we have already so frequently urged for all the provinces, that the registers should be constantly inspected by all officers on tour, and that in this manner very valuable aid might be rendered by the vaccination staff, who would, at the same time, be obtaining most important information for their own special department. We observe that the Commissioner has insisted on a stricter scrutiny of the registers.

3. *History of the Chief Diseases: Smallpox and Vaccination.*—The most marked feature in the health history of 1891 in Coorg was an epidemic of smallpox, which caused 476 deaths compared with only 34 in 1890. The disease was general and fatal in all the circles of registration. According to the figures in the statement at page 12, vaccination of late years has made very great strides in Coorg. Ten years ago, in 1882–83, the number of persons successfully vaccinated was only 4,044; in 1891–92 the number was 9,885, yielding the high proportion of 54 successful cases per 1,000 of population. The statistics of vaccination for 1891–92 are all satisfactory and indicate progress, except the high percentage of success in re-vaccinations (89·38), which is suspicious. The Inspector verified the results in 6,887 of the cases, a very large proportion. On the other hand, the epidemic of smallpox, with its 476 deaths, is a great fact on the other side to show that the protection was still insufficient. It is remarkable that of the total deaths only 28 are returned in infants under one year, and 123 in children under twelve. Another anomaly is, that while the monthly maximum number of fatal cases (84) occurred in December, the next highest number (69) occurred in the month of August,

a time when in India, smallpox is generally at its minimum, and, in fact, almost completely in abeyance. Some particulars as to previous epidemics of smallpox in Coorg before vaccination had been so widely practised, would have been of interest, and have aided materially towards a just estimate of the value of the vaccination which has been done. The Civil Surgeon records his opinion that into one taluk the disease had been imported from Mysore, and into another probably by coolies from South Canara and Malabar. But such conclusions, however satisfactory they may seem, are of very little practical value as regards prevention. Vaccination, if it is to afford real protection, must be such as will prove thoroughly efficient when danger threatens, or little confidence can be placed in it.

4. *Cholera.*—Again, during another year, Coorg was almost entirely free from cholera. The total deaths registered under this head in 1891 was seven; in 1890 the number had been five. In the short account given it is said that "immediately the first case was reported, stringent orders were "issued regarding disinfection and isolation of the cases, which evidently prevented the disease "assuming an epidemic form." In our Memorandum on the Coorg Report for 1890, we remarked on a similar statement regarding the few cholera cases of that year, and what we then said applies with even greater force to the more positive statement now made. It is not possible to accept the conclusion that an epidemic had been prevented by disinfection and isolation without very definite proof, because there are two sets of facts which are opposed to it. First, we know that instances are constantly occurring in which, without either of the precautions named, the disease has been confined to a few isolated cases, and secondly, there has been ample experience to prove that in India, such precautions have entirely failed to prevent an epidemic. The matter is of importance, because, as we observed last year, "there is too great an inclination to trust to the protection which such measures "are supposed to confer, and therefore to neglect those sanitary improvements in which we believe "the only real protection is to be found." It is not stated how many persons were attacked with cholera in 1891. The seven fatal cases were reported between the 11th and 25th November, from four different villages. A full account of all such occurrences should be given, so that the results may be fully tested. The date of each case, the time and mode of disinfection applied, and the degree of isolation attained, are all important points to be noted, as well as the agency by which these are carried out. The checking of a cholera epidemic, if it can indeed be checked by such means, is a question, not only of interest, but of real practical moment in Indian village life, and every information tending towards its satisfactory solution should therefore be recorded. It is to be feared that there will be ample opportunity of testing the efficacy of such measures, not only in Coorg, but also in all parts of India. We would again draw attention to the omission of the cholera map, and of the prescribed statement which should be attached to it.

5. *Sanitary Works.*—On sanitary works, Rs. 1,432 were spent by the Public Works Department, and Rs. 4,597 by the municipalities, but the few original works were of a very minor kind. Among the improvements, repairs to roads and buildings are included. The principal town of the province (Merkara) evidently stands much in need of sanitary reform. Under the three great heads of conservancy, drainage, and water supply, there are in it manifest evils to be dealt with. We are glad to observe that steps have been taken in this direction, and that a water supply scheme, to which money has been very liberally subscribed by the townspeople, now only awaits sanction. For the town of Somvarpet, also, improvement is in prospect, as a merchant has offered to bear the whole cost of converting the Anekere tank into a drinking-water reservoir, a work the completion of which it was expected would be accomplished in 1892. No sanitary estimate of towns and villages has been furnished, such as is given in nearly all the other sanitary reports. A description of all the towns and rural circles, and an examination of local disease causes, in connexion with the mortality from the chief diseases, should be the basis for building up sound sanitary progress.

6. *Sanitary Board.*—The Sanitary Board seems to have remained as it was before, consisting of the Commissioner, the Executive Engineer, and the Civil Surgeon. It held three meetings during the year. They were occupied in consultations. It was agreed, among other things, to draw up a few simple sanitary rules for the benefit of the coolies in the coffee plantations, and also that the rules for the better provision for sanitation in the Central Provinces are not suitable to Coorg.

18th July 1893.

No. 10.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Madras for 1891.

General Characteristics of the Year. Suggested Amalgamation of Diagrams.—This report supplies much valuable and detailed information, both as respects the sanitary condition of the people during the year, and also regarding the measures which were being taken to improve that condition. Moreover, the various questions involved are fully discussed in the orders of the Government of Madras. The general history of the year as regards health was unfavourable. Owing to the prevalence of cholera, smallpox, bowel complaints, and "all other causes," the mortality was higher than it had been for years. The rainfall was the lowest registered for many years, and as a consequence the principal food grains were dear. The facts for each district are very clearly set forth in a series of diagrams, which indicate the monthly rainfall and price of the main articles of food used by the people of that district, and these facts are given not only for the year under report, but also

for the two preceding years, as well as the average of the ten years previous. In the subsequent section of the Report, which deals with vital statistics, a similar series of diagrams is given to illustrate the births and deaths in each district, by means of which the results are shown in a striking way. Is it possible to give all these important facts, the rainfall, price of food, birth-rate, and death-rate of each district on one diagram? At present each district has three, one for rainfall, one for price of food, and one for birth and death rate combined. If the change we suggest could be effected, much would be gained, for, irrespective of the economy of space, and the economy of time now required to compare one diagram with another, the facts would be presented side by side in the most forcible manner. Although there are difficulties in carrying out this suggestion, they do not appear to be insuperable.

2. *Vital Statistics. Improvement of Registration.*—No change was made during the year in the system of registering births and deaths. We observe that the suggestion made in our Memorandum on the Report for 1889 had already been anticipated in the Madras Presidency since 1879. "All "deputy inspectors of vaccination," it is said, "are required to examine the birth and death registers "of any village or town they visit, and in their weekly diaries they report on the condition of the "registration of births and deaths as found on personal inspection." It would be of interest to have some illustrations of these diaries of the actual state of things found in a few towns and villages—how far the registers were borne out by the information otherwise obtained, whether any fictitious entries were discovered in the registers, or merely errors of omission arising from neglect, all which information is of importance as showing how far the statistics are to be accepted as fairly accurate. From the Vaccination Report for 1891–92, there seem to be 57 deputy inspectors of vaccination, generally two or three in each district, so that the aid they can render in this matter of registration is considerable, while at the same time the information they obtain regarding births, and deaths from smallpox has a direct bearing on their own immediate work. Inspection of the registers of vital statistics no doubt forms part of the district medical and sanitary officer's duties in visiting towns and villages, to which reference is made, paragraph 84 of this Report. Here also a few examples of the results would serve to show how the system works, what are the main difficulties to be encountered, and how they can best be overcome.

3. *Births. The Census of* 1891.—It is disappointing to find that the statistics of 1891 are still based on the Census of 1881. Nearly all the other provinces have employed the census figures of 1891. As the year of the census employed becomes more distant, the ratios based on it become more inaccurate. But even after making due allowance for this, there is evidence of improvement in the registration of births. There has been a steady rise in the rate, which stood for 1891 at 32·4 per 1,000, and, notwithstanding the heavy mortality of the year, the births exceeded the deaths by 6·2 per 1,000; of the 22 districts there are only seven in which the rate was under 30 per 1,000. The excess of deaths over births in the town of Madras to the extent of 14·7 per 1,000 is remarkable, and is attributed to the prevalence of cholera, fevers and bowel complaints. Excess of deaths frequently seems to be due to neglect of birth registration, but Madras, in 1891, heads the list of births with a ratio of 44·7 per 1,000. The mere addition of such a large proportion of infants to the population during the year conduces largely to a heavy death-rate. The Sanitary Commissioner has not discussed the effect of age on the district rates, but there is sufficient evidence in Statements I. and IV. of the Appendix to show that the excess mortality was greatly due to the deaths among young children. A diagram has been added to this Report, similar to the one which has been employed for some years in the Bombay Report, in order to give the birth-rate in each registration circle of the Madras Presidency, and as these are ranged by concentric circles, it is easy at once to see those localities where the rate is large, and those other localities in which it is small. In some districts examples are to be found of great variations, while in others the extremes are less marked. By the aid of this diagram the local and all other authorities concerned can see at once the places where the registration seems to be faulty. The eight circles which returned births below 20 per 1,000, and the 60 others in which the rate was under 30, all suggest the need for local inquiry.

4. *Deaths.*—During 1891, 747,553 deaths were registered, or the equivalent of 26·2 deaths in every 1,000 of the population, the highest mortality recorded since 1878. Cholera, smallpox, bowel complaints, and "all other causes," as already mentioned, largely contributed to this result. On the other hand, fevers were somewhat less fatal than in the previous year. The excess of male over female mortality, 27·1, compared with 25·3, is much in the same proportion as in most of the other provinces. One of the most striking features of the year is the unusual distribution of the mortality by months. In the first half of 1891 there was no great change from the experience of former years. The ratios for January, February, March, April, May, and June, present no great or constant increase over the ratios of 1890, or over the average of the previous ten years, but from July onwards there is a decided and steady increase, until in December the mortality stands at 3·4 compared with 2·1 in 1890, and 2·2 the average of the preceding decade. A circular diagram, similar in design to that already mentioned in connection with birth registration, is given to show the death-rate recorded in each registration circle of the Madras Presidency; of these registration circles there are 238. Here great variations are naturally to be expected, and nothing would be more unwise than to look for uniformity, or even an approach to uniformity. Much must depend on seasons and local conditions, and the aim of sanitary administration is to discover how far these last are responsible for the results, and how they can be improved so as to reduce the amount of sickness and death. The diagram is of great practical use, because it shows the mortality circle by circle in each district, and by the manner of its arrangement calls attention to the great variations presented by the circles even in the same district.

5. *History of the Chief Diseases: Cholera.*—During the year nearly 100,000 deaths from cholera were registered throughout the Presidency of Madras, yielding a ratio of 3·5 per 1,000. In 1877 the deaths ascribed to cholera equalled 12·2 per 1,000, but this ratio was altogether exceptional, and due no doubt in great measure to the famine of that year. In the 13 years which have elapsed since 1877 the cholera mortality has never exceeded 2·7, and on several occasions has been under ·5. The cholera mortality of 1891 was thus very heavy as compared with that of other years; one noteworthy feature in it is the unusual severity of the disease in the months of July, August, and September, when, as a rule, the deaths from this cause are comparatively few. In August over sixteen thousand cholera deaths were recorded, the highest number in any one of the previous nine years having been very little over seven thousand, or less than half the figure for August 1891. In six of the 22 districts the mortality for the year exceeded 5 per 1,000. In the district of South Arcot, it reached the maximum of 8·8. The August severity of the epidemic was most marked in Cuddapah Kistna, Kurnool, and North Arcot. In several of the towns the loss of life was heavy A list of 26 is given, in each of which the deaths from cholera exceeded 5 per 1,000, and in seven of these it exceeded 10, the maximum of 21·9 having been obtained by the town of Palni, in the district of Madura. In most of these 26 towns the water supply and drainage are reported to be very defective. The experience of 1891 throws no new light on the cause of the disease, but confirms the practical conclusion so often expressed that "its spread in a place depends largely on the sanitary "conditions present, and the very inferior water supply. In consequence of deficient rainfall in "1891, many of the tanks and wells, which were drinking-water supplies, became dry, and people "had to use any water they could obtain. Further, owing to the drought, the water in the tanks "and wells was much reduced in quantity, and therefore had a much larger percentage of dissolved and suspended impurities." The relative intensity of the epidemic is clearly shown in the map, but in conjunction with the general facts therein portrayed the figures given in Annual Statement VII. should also be considered. Even in those districts which are coloured darkest the disease was by no means spread over the whole area. Even in South Arcot, which suffered most, the number of villages which returned deaths from cholera was less than half of the total number in the district. Of the 238 circles of registration, 211 suffered, showing how wide was the distribution of the disease, and yet in only 8,975 out of 44,449 villages was its presence recorded, showing how much it was confined to particular spots over this wide area.

6. *Smallpox and Vaccination.*—41,322 persons died of smallpox during the year, or a proportion of 1·4 per 1,000—a higher ratio than that of any year since 1884, when it equalled 2·1. Of the total deaths in 1891, 15,593 were in children under twelve years of age. High as this number is, it is satisfactory to note that it represents a diminished proportion of mortality in children as compared with 1890. The increase of smallpox mortality in 1891 was by no means general over the Presidency; in one half of the districts it was lower than it had been in the year previous. The highest district death-rate was 5·3 in Kistna. A special table is given in paragraph 43 to show the smallpox mortality in each of the 55 municipal towns during 1891, and also the ratio per 1,000 of successful vaccination in them. At Calicut there occurred the very high death-rate from smallpox of 20·4 per 1,000, but the next highest was only 8·7; with the exception of seven others none exceed 3 per 1,000, and many are represented only by fractions. The column concerning vaccinations, we conclude, refers to the results of one year only, and there does not seem to be any accord between the figures it contains and those relating to smallpox, for low vaccination rates and low smallpox rates frequently run together, while on the other hand, high smallpox rates and high vaccination rates are also found in company—a result which probably arises from the fact that activity on the part of smallpox as soon as it attracts attention leads to increased exertions on the part of the vaccination department. It is very important that the two sets of facts should be carefully considered, because if it cannot be shown that vaccination has diminished smallpox beyond all manner of doubt, there is little to be said in its favour; but in order to make evidence of this kind of much value, it must, as we have frequently urged, be taken for a series of years. This is a question which ought to be dealt with fully in every sanitary report. The record of increasing number of vaccinations, year after year, of the large proportion of success attained in them, and of the great number of persons, and especially young children, so protected, is very satisfactory, but it is not nearly so satisfactory as evidence of the unquestionable reduction of smallpox would be. We do not, by these observations, desire even to imply the smallest want of confidence in vaccination, or to question the good that has been done by it in the Madras Presidency, but it is clearly desirable, if for no other reason than to aid in overcoming the prejudices which still exist against vaccination, that the good it has done should be fully demonstrated. The separate Report for 1891–92 is very satisfactory as regards the number vaccinated, which is the highest ever attained, the measure of success, and the large number of children successfully operated on. The number of infants protected had risen to 210,652. There is still, however, much to be done to overtake the recorded births, which numbered 924,238 in 1891. The accuracy of the returns was verified in a large proportion of cases on actual inspection by the Deputy Inspectors of Vaccination.

7. *General Results.*—The other headings under which deaths are recorded do not call for any comments beyond those already made by the Sanitary Commissioner and the Government. We shall, however, reproduce in a succinct form the principal figures regarding both births and deaths in the Madras Presidency during 1891, as they show the magnitude of the sanitary considerations involved, and of the sanitary work to be done.

	1891.
Population (according to the Census of 1881) - -	30,835,771.
Births registered - - - - -	924,238 = 32·4 per 1,000.

Causes of Death.	Number of Deaths registered.	Ratio of Deaths per 1,000 of Population.
Cholera	98,773	3·5
Smallpox	41,322	1·4
Fevers	247,029	8·6
Dysentery and diarrhœa	34,223	1·2
Injuries—Suicide	1,916	—
„ wounds and accidents	6,322	—
„ snake bite, or killed by wild animals	2,304	—
Total injuries	10,542	·4
All other causes	315,664	11·1
Total from all causes	747,553	26·2

8. *Sanitary Defects and Remedies.*—In his section on sanitary works, the Commissioner deals chiefly with minor matters such as the sinking and repairing of wells, the construction of latrines, and the improvement of village sites. The larger schemes of drainage and water supply which were either in progress or only under consideration are discussed in the separate Report by the Sanitary Engineer. Towards general cleanliness some progress had been made, but in this important matter places vary greatly. "In some towns the conservancy arrangements were well looked after, but in "others they were very indifferently attended to." The information concerning local conditions and improvements is abstracted in three statements; one for municipalities, one for local fund circles, and one for registration circle villages. For the first two, the condition of the water supply, drainage, and conservancy in each is briefly described, the death-rate of the year is given, there are a few remarks on the general health, and a separate column shows the minor sanitary works that were executed during the year. The abstract for registration circle villages is on the same general model, but omits the important item of the death-rate, which might be added with advantage in future reports. In order to be complete, moreover, the column headed "Sanitary works" should include not only the minor improvements noted by the Sanitary Commissioner, but also more complete information regarding the major works which form the subject of the Sanitary Engineer's Report. For practical administration it is necessary that the existing evils should be clearly shown, as evidenced, not only by description, but also by the death-rate, and at the same time that all the measures which are being taken to remedy these evils should be fully stated In the matter of inspections the department was very active; every one of the 55 municipalities was inspected either by the Sanitary Commissioner or his Deputy, and 117 other places besides. There is every reason to believe that such careful visits as are described, in which the attention of the native gentlemen of each locality is drawn to prominent defects, and to the great importance of remedying them, must be attended with good results.

9. *Sanitary Engineer's Report.*—The year's engineering work, although less than was anticipated, forms a very gratifying commencement. The Sanitary Engineer remarks that "there has been "greater activity displayed and greater anxiety evinced by councils in regard to speedy improvement "in water supply or drainage than at any period since the introduction of local self-government, and "if only those schemes now under preparation, in addition to those already sanctioned, are carried "out within a reasonable period, few of the provinces of India will be able to show such a stride in "sanitary progress." In order to meet growing demands for the services of the Department and to provide proper supervision, the appointment of three Assistant Engineers was sanctioned, "each to be "in charge of a circle with the executive control of all works under execution, and all surveys in "progress within that circle." Of the 55 municipalities, 33 were inspected by the Sanitary Engineer during the year, and 17 by the Assistant Sanitary Engineer; and in the Report a short summary is given to show what has been the outcome of these visits, what surveys have been made, what schemes prepared, and what work actually done. Regarding the great majority of them there is some action to be reported during the year. In 22 of them surveys had been made and levels taken for water supply or drainage, or both combined; and for 17 of these, schemes were being prepared. For 11 other places schemes for water supply or drainage had been completed and submitted to the Government. Of these 11, all but one, which was still under reference, had been sanctioned. At Kumbakonum, Kandal, and Conoor, some progress had been made in the works, and at other places preliminary arrangements were being matured for commencing them. In addition to all these, the Sanitary Engineer had submitted special reports on the effect of the Dougal-Cheruvu (a large tank) on the health of Cuddapah, on the water supplies of the Coimbatore and Trichinopoly jails, and on the proposed improvement of the River Cooum. The record altogether is one not only of valuable work being put in train, and also to some extent actually commenced during the year, but is, moreover, one of great promise for the future.

10. *The Sanitary Board.*—No change has been made in the constitution of the Provincial Sanitary Board, which consisted, as before, of two members, the Sanitary Commissioner and the Sanitary Engineer, nor was there any change in the rules under which their work was to be carried on. In respect of their annual conjoint Report which was to form Part III. of the Sanitary Report of the year, the Government has directed that this conjoint Report is not required, and that it is sufficient to have the Sanitary Report submitted in two parts as has been done with this Report for 1891, the first being signed by the Sanitary Commissioner and the second by the Sanitary Engineer.

18th July 1893.

No. 11.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bombay for 1891.

1. *General Results as regards the Public Health.*—Compared with 1890 the year was unhealthy. The total number of deaths registered was 513,132, whereas in 1890 the number had been 463,616. The deaths of 1891 thus exceeded those of 1890 by 49,516. The causes to which the deaths in the two years are attributed are contrasted in the following statement:—

Causes of Deaths.	1890.		1891.	
	Number of Deaths.	Ratio per 1,000.	Number of Deaths.	Ratio per 1,000.
Cholera	3,259	0·20	17,850	0·95
Smallpox	2,877	0·17	1,491	0·08
Fevers	344,897	20·96	368,913	19·60
Dysentery and diarrhœa	36,037	2·19	37,728	2·00
Injuries	5,883	0·36	5,887	0·31
Other causes	70,663	4·30	81,263	4·32
Total	463,616	28·18	513,132	27·26

Under every head excepting smallpox there was an increase in actual numbers especially under cholera and fevers. The death-rates, however, are somewhat lower for 1891, not only as a whole, but also under nearly every head, because these rates are calculated on the increased population given by the Census of 1891, whereas those for 1890 are calculated on the Census of 1881. It is not possible to avoid such discrepancies, which must inevitably arise when the results in the earlier years of a new census are compared with those in the later years of the previous decade. A certain annual increment to the population might be assumed, as is done in England, but even in England such assumptions have not always proved correct, and in India they would probably lead to errors as great as those they were intended to obviate. In dealing with the actual numbers, however, all such source of fallacy is avoided, and there is ample evidence in these figures to show that the year 1891 was decidedly more unhealthy than the year 1890. It would appear, however, that this difference in the character of the two years was not general over the Bombay Presidency, but was confined almost entirely to the Western and Central Registration Divisions. These two alone account for almost the whole excess of 49,516 deaths. In the other three registration divisions the number of deaths in each of the two years was almost identical. If we examine the figures more in detail, we find that in every one of the ten districts which compose these two registration divisions, with the single exception of Satara, the deaths of 1891 exceeded those of 1890. In his remarks on the rainfall, the Sanitary Commissioner has shown that in thirteen districts the amount was less than in 1890. This deficiency was most marked in the districts of Ahmednagar, Poona, Bijapur, Kanara, and Ratnagiri. Several of these are districts in which there was the most decided increase of mortality in 1891, but the meteorological data are somewhat scanty. A more extended comparison is desirable. It is not sufficient to take only two years and place the results in them side by side. It is only by taking the results over a series of years, year by year, and comparing the registered mortality in each of them, that sufficient data can be obtained for forming conclusions. As regards food, it appears that in thirteen districts prices were higher than in the year previous.

2. *Statistics in relation to the Census.*—As already mentioned, the statistics of both births and deaths are based on the new census. This Census was taken on the night of the 26th February 1891, and gave the population as 18,857,044, or an increase of 2,402,630 on the census taken on the 17th February 1881. Of these 18,857,044, however, 636,698 were Europeans or Eurasians, so that the Native population with which the annual statistics have to do stood at 18,820,346. A more detailed comparison of the results of the two censuses, district by district, would have been of interest, and also an examination of the totals of the Census of 1891, in both districts and large towns, compared with what the figures would have been if the number of births registered during the previous ten years had been added to the population of 1881, less the number of deaths reported during this same period. Independent of the European troops, the statistics of which are otherwise provided for, there is a large class of Europeans and Eurasians in all parts of India, regarding whom no sanitary information is now obtained. In the Bombay Presidency they number over 600,000, and it is very desirable that some means should, if possible, be devised for recording all the births and deaths that occur among them.

3. *Registration of Births.*—No change seems to have been introduced into the system under which births and deaths are registered. In our memorandum on the Bombay Report for 1890, we drew attention to the advantages to be derived from the inspection of the registers and a comparison of the entries they contain with information regarding such occurrences which can be gathered on the spot, and we need only refer here to what was said on this subject in the memorandum. A few illustrations of the detailed results of such inspections would add much to the interest of the section

devoted to vital statistics, and would at the same time serve to show what amount of dependence is to be placed on the records. This section of the Report, as usual, contains a very full and careful analysis of the figures for the year as regards both births and deaths. Although the recorded births numbered 41,562 more than in 1890, the ratio, being calculated on the larger population of the new census, is smaller, 36·27 compared with 38·97. The average for the province as a whole is composed of extremes, varying from 18 in the city of Bombay, and 22 in the Hyderabad district, to 45 in the district of Ahmednagar. Special attention is called to the low birth-rate in the city of Bombay. In this respect it stands fifth from the bottom of the list of the 56 towns of the Presidency, but, as has been frequently pointed out, regard in this matter must be had to the proportion of males and females in the population, and from this point of view Bombay presents a remarkable contrast to other parts of the country. In paragraph 3 the male and female population are shown for each collectorate according to the new census, and from this it appears that, while in other collectorates the number of the two sexes more or less approximates, in the city of Bombay there is a remarkable divergence, for out of a total of 806,144, 507,681 were males and only 298,463 females. It is a defect in the standard statements that the population of each district is not distinguished by sex, and it is certainly very desirable that, in discussing the statistics of towns or other well defined areas, this important element should not be left out of account. The proportion of male to female births throughout the Presidency is high (108 to 100). It will be observed that this provincial average is the outcome of extremes, varying from 103 to 131. In all the Sind districts the excess of male births is very marked. This is one of the many evidences of error in the registration records of this part of the province. The difference in the birth-rates of urban and rural areas is remarkable, and points to serious imperfections. The general result is a ratio of 28 for the one, and 37 for the other. Excepting Sind, all but three of the districts show an excess of births in rural tracts, and in some especially noted by the Sanitary Commissioner, the excess is very large, as, for example, in Nasik, the most marked of all, where the births in towns was 25, and in the country 43 per 1,000. In addition to noting these remarkable discrepancies, it were well that some local inquiry were instituted in order to discover the cause, whether they are the result of errors and omissions in the primary registers, or whether they are to be accounted for by some abnormal distribution of the sexes or other causes. The very high birth-rate returned by certain towns is another point in which further inquiry might be made with advantage. In 16 out of the 56 it exceeded 40 per 1,000.

4. *Deaths.*—The statistics of deaths have already been referred to in the general results of the year, and they have been very fully discussed by the Sanitary Commissioner, both as regards the causes to which they were ascribed, and their distribution according to localities. The district rates varied between 42 in Broach and 14 in the Upper Sind frontier; in the towns there are the extremes of 64 in the one at the top of the list, and 10 in the one at the bottom. It is worthy of notice that while the birth-rate in rural circles so much exceeded that of towns, 37 compared with 28, the death-rate occupies the reverse position, and was 29 in towns compared with 26 in the country. It is difficult to say how far this last result may be due to the greater salubrity of the country, but, however this may be, it seems very improbable that the figures concerning births represent the actual facts. In other provinces the higher ratios obtained from rural areas have been explained on the ground that such occurrences are much more likely to be known in the country than they are in towns. The community is small, and all the events of every-day life are talked about so as to become easily cognizable by those whose duty it is to record them. Births, therefore, which often escape notice in towns are recorded in villages; on the other hand deaths are not easily concealed in either. Such an explanation would account for the fact that there is not that great divergence between the death-rates of the town and country areas in the Bombay Presidency as there is between the birth-rates, but the object in view is not so much to account for the suspected error as to rectify it in the future. For this purpose nothing could be better designed than the detailed statements which the Sanitary Commissioner has furnished, showing in every district each registration circle separately, its area, population, number of villages it contains, the births, the birth-rate, the deaths, the death-rate, and the proportion due to each of the chief diseases. By this means it can be seen at a glance how enormously even neighbouring places vary, and the materials are at once available for local investigation as to the accuracy of the statistics, or, in the event of there being no good reason to doubt their accuracy, as to the local causes by which the great divergence in results is to be explained. To take the district of Khandesh by way of example, each of the 26 registration circles into which it was divided (22 rural and 4 urban) is shown separately, and the results compared with other years. The record is valuable, not only for the purposes already indicated, but also because it shows very clearly the distribution of the principal diseases.

6. *History of the Chief Diseases: Cholera.*—The main facts regarding cholera during the year are that the disease was much more prevalent than it had been in 1890, the number of deaths recorded having risen from 3,260 to 17,850; that the disease was widely distributed, having appeared more or less in 18 out of the 24 districts, but that it was severe in only four, which lie contiguous, Bijapur Sholapur, Poona, and Ahmenagar, in which the mortality varied from 6 to 2 per 1,000; that in few of the others did it much exceed 1 per 1,000, having been much less in many, and almost entirely absent from Sind; and that, although the extent of its distribution is still further indicated by the fact that 144 out of 285 registration circles returned fatal cases, the number of villages affected was very small, only 1,600 out of a total of 25,206. The main facts of distribution are shown on the map, but we would suggest that the colours employed to differentiate the various degrees of epidemic prevalence should be more distinct. At present they are so nearly of the same shade that their individuality is lost. The maximum cholera mortality in any locality was in the Bijapur rural circle, where it equalled 9·88 per 1,000; the nearest approach to this was 9·34 in the Jamkhed rural circle of

Ahmednagar; of the towns, Phandharpur, in the district of Sholapur, recorded the highest mortality from cholera, 5·86.

6. *Smallpox and Vaccination.*—The history of smallpox in the Bombay Presidency exhibits as usual very marked fluctuations. During the last 12 years the deaths ascribed to this disease have varied from 539 in 1881 to 14,438 in 1884. In 1891 the number was 1,491, or about half of what it had been in the year previous. It is interesting to observe that the decrease was very general. In every district, with four exceptions, the number of deaths from smallpox in 1891 was less than it had been in 1890. The highest mortality in any district was ·24 in Khandesh, and among the towns entered in Statement VI. the highest was 1·69 in Nandurbar, in that district. Of the deaths from smallpox in 1891, 27·50 per cent. occurred in infants under 1 year, 50·17 in children between 1 and 12, and the remaining 22·33 in persons over 12. The separate Vaccination Report for 1891–92 shows much excellent work during that year. The total record includes 830,873 vaccinations, and 62,274 re-vaccinations, with a percentage of success of 94·8 in the one, and 61·9 in the other. In the Bombay Presidency, exclusive of the Native States, the Sanitary Commissioner calculates that of 568,845 infants under 1 year who were available, 435,608 were protected during the year by successful vaccination, or a percentage of 76·58. This is a very satisfactory result, which has, moreover, to a very large extent been verified by actual inspection As we have frequently observed, however, the real test of the efficiency of vaccination is its power to protect the population from smallpox, and this can only be applied by careful statistics of the disease over a series of years, taken in conjunction with the statistics of vaccination during the same period.

7. *Fevers, &c.*—The other main heads under which the deaths are recorded call for little comment. The deaths ascribed to fevers were very numerous, more so than in any one of the previous twelve years, and another unusual feature in their history is that the maximum monthly total took place in December. Both these results are explained in the main by a severe epidemic of influenza. More particulars of the epidemic would have been of much interest, especially as regards the areas affected, and the time during which the disease lasted. In the Gujerat registration district, in parts of which it appears to have been most marked, the Deputy Sanitary Commissioner reported that this epidemic wave occurred in the months of March and April 1890, that it recurred in November and December 1891, and continued in January 1892. The district fever mortality varies enormously, from 37 in Broach to 8 in the city of Bombay. In one town of the Ahmedabad district (Vizamgam) the maximum 53 was reached. The total deaths from dysentery and diarrhœa do not show any stricking departure from that of other years, but the range in the district ratios is great, between 4·22 in Kandesh and 0.04 in Hyderabad.

8. *Sanitary Defects.*—In the "sanitary estimate of towns and villages" which forms one of the appendices of the Report, certain local defects are noted, and further information on the same subject is given in Section X. concerning a number of places which were inspected by the Sanitary Commissioner during the year. In both, however, the facts relating to the prevalence of disease might, with great advantage, be brought into more immediate juxtaposition with the facts relating to the conditions of the locality. The great object of collecting the records of births and deaths is that they may form the basis of local inquiry—what diseases, if any, have been prevalent, what local conditions cause or favour these diseases, and by what means may these disease causes be best removed? In the "Sanitary Estimate" many illustrations appear of evils, some of which at least might be mitigated by greater care. In several places the water-supply is scanty. In many instances, while the source of supply is noted, nothing is said of the water, or of how far it is apt to be polluted. In some of the circles "Howds" and "Ads" and "Vav" are spoken of as the sources of supply. These are probably abbreviations, but we have been unable to find out what they mean. In some places the water is described as "not good," in others as "brackish," in many the wells are unprotected and without proper arrangements for draining off the waste water; at Broach the water is said to be "bad," at Dohad "impure and unfit." Under the heads of drainage and conservancy, also, there is much to be done; the want of proper drainage is a frequent complaint, either there is none at all, or the system is imperfect. In not a few places the water sinks into the back yards. Surface cleanliness seems to be much neglected, and in many places there is no conservancy establishment. The "Sanitary Estimate" from which these extracts have been taken is a summary of the remarks made on their inspections by the Deputy Sanitary Commissioners, and by the Civil Surgeons. We observe similar differences in the amount of this inspection work done in 1891 to those commented on last year; one Deputy Sanitary Commissioner inspected 146 towns and villages, while another inspected only ten. The Civil Surgeon of Surat inspected ten towns, while some of the other Civil Surgeons only inspected one. There seems to be no good reason why all these officers should not afford valuable and extensive aid in this most important work directed to further sanitary improvements.

9. *Sanitary Commissioner's Inspection Notes.*—The condition of the towns visited by the Sanitary Commissioner in the course of his annual tour, and described in the *resumé* which he gives of his inspection notes, exhibits a very unsatisfactory state of things. In many of them there was no advance since the date of the previous inspection, and in nearly all grave evils still existed which must exercise the most deleterious influence on the health of the inhabitants. At Poona, for want of free flushing, the sewage in the old covered gutters and drains stagnates and pollutes the soil and air. At Manmad the sanitary condition of the place is described as "most unsatisfactory"; the river from which drinking water is chiefly obtained is fouled in every possible manner above the town. The state of the latrines is a standing menace to the health of the inhabitants. There is no filth cart, and surface cleanliness is neglected. "The town of Malegaon is without a public latrine

" or night-soil cart. The drinking water in the river and canal above the town is freely polluted in " every possible manner by man and beast. The whole place was indescribably filthy." At Nasik the river from which the great majority of the inhabitants draw their water supply is as much fouled as ever by the drainage of the town, which overflows from cesspits on both banks. The sanitary condition of Rander is described as " grossly neglected." At Surat " no progress in sanitary matters to " be reported. The most pressing need is drainage to carry off the contents of private privies and " cesspools, which overflow into the streets." Of Anand it is said " the most pressing need of this very " dirty and crowded town is the protection of the two tanks from human ordure and manure heaps, " by raising the parapets where they exist and throwing an earthen dam round them to intercept " filth. The banks of the tanks are at present used as latrines, and consequently are in a most foul " condition." At Ahmedabad the conservancy arrangements are " unsatisfactory." The Sanitary Commissioner speaks of " the foul and offensive condition of the surface in and around the town of Broach." At Sholapur, " the gutters were choked in many places with waste water and sullage stagnat- " ing and stinking in the most crowded parts of the town." Many of the towns in which these and the like evils are described are large and populous places of importance, with a considerable municipal income. In the orders of the Government, the attention of Collectors and Presidents of municipalities has been drawn to the great defects noted in the Sanitary Commissioner's inspection reports. The illustrations above given are merely samples of what may be found more or less in nearly every one of these reports The great aim of sanitary administration is to remove such evils, and we trust that a decided effort will be made to deal with them.

10. *Sanitary works.*—The section devoted to sanitary works executed during the year merely refers to Appendices III. and IV., in which all the information on this important matter has been tabulated. Appendix III. is concerned with military works only, and any reference to them may be postponed until we have to consider the Report of the Sanitary Commissioner with the Government of India which has to do with the wants of the troops in all the three Presidencies. In Appendix IV., the first part of which is devoted to municipalities and the second to local funds, the last column is designed to include new works. In this a number of minor improvements are mentioned, and in some few it is noted that schemes of drainage and water supply were under consideration, but the only scheme of any magnitude which seems to have been actually executed during the year was the new waterworks at Ahmedabad, which were formally opened on the 11th June 1891.

11. *Sanitary Board.*—One most important step has been taken, and that is the appointment of a Sanitary Engineer. The orders on this subject did not, however, issue till January 1892, and there are thus no proceedings of the Sanitary Board to be chronicled for 1891. The Board, it appears, is composed of two officers, the Sanitary Commissioner and the Sanitary Engineer.

18th July 1893.

No. 12.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of the HYDERABAD ASSIGNED DISTRICTS for 1891.

The Year generally Unhealthy throughout the Province.—In the Hyderabad Assigned Districts during 1891 the public health was considerably worse than it had been in 1890. Not only were the total deaths more numerous, but, with the single exception of smallpox, there was an increase under every one of the great heads according to which they were registered. The figures for the two years stand thus:—

	1890.	1891.
Cholera	847	7,958
Smallpox	324	34
Fevers	47,894	49,850
Dysentery and Diarrhœa	13,328	22,007
Injuries	1,004	1,090
All other causes	29,623	34,619
Total	93,020	115,558

These results are not to be ascribed to exceptional sickness in particular parts of the province. They were general. In every district the mortality was higher in 1891 than in 1890, and the same remark applies to almost every one of the 33 towns for which separate statistics are given. There is thus ample evidence to show that throughout the province some great general causes were at work during 1891 which rendered that year more unhealthy than 1890. What these causes were does not appear. The question is one of great difficulty; but as we remarked in noting on the Report for 1890, it is very desirable that the facts as respects meteorology, the supply of food, and any other change in general conditions should be carefully recorded year after year in the hope that they may eventually form the basis for arriving at some sound conclusions.

2. *Steps for Improvement of Registration.*—As we have frequently observed, one most valuable means of improving the registration of both births and deaths is constant examination of the registers, not only by the Sanitary Commissioner and his subordinates, but also by all other officials on their tours. In Berar considerable progress has been made in this direction. The Civil Surgeons and Superintendents of Vaccination inspected and tested a large number of registers, while the similar inspections by district officers and police officers not only tend in the same way to a more accurate keeping of the records, but must also impress on the people the importance which is attached by the Government to the correct keeping of them. Another important step towards improvement in this matter has been taken by making the *patels* in towns responsible for ascertaining and reporting all births and deaths occurring in their towns, and requiring further that these reports should be in writing, and not merely verbal as they had been previously. In towns registration has hitherto been more defective than in rural tracts, and it is hoped that under the new system distinct improvement may be seen. Some illustrations are given of the testing of the registers by the sanitary officials, but there is nothing to show how far similar inspections were made by the officers of the Revenue and Police Departments, or what results were obtained on such inspections. It is very desirable that such information should be given in future annual reports.

3. *The Census of* 1891 *in relation to Births and Deaths.*—The statistics of the births and deaths registered during 1891 are based on the Census of that year. The Census Report had not yet issued in full so that the Sanitary Commissioner was not able in this Report to discuss many questions concerning the births and deaths registered during the preceding 10 years which this Report will suggest. This we must look for in his Report for 1892. Meanwhile we can only note the general results that, according to the Census of 1891, the population of the Hyderabad Assigned Districts stood at 2,897,040, of whom 1,491,500 were males, and 1,405,540 females. The population increased during the 10 years by 224,367, or a proportion of 8·3 per cent., equivalent to ·8 per cent. in each year. According to the births and deaths which had been registered this increase would only have been ·5 per cent. per annum, but, as the Sanitary Commissioner observes, there are other factors to be taken into account, such as emigration and immigration, and a complete examination of the Returns can only be made when the Census Report has issued in full.

4. *Births.*—The births recorded during 1891 amounted to 121,755, compared with 111,450 in 1890. The increase of 10,305 affects the annual ratio very slightly, 42·8, compared with 42·5 per 1,000, because the rate for 1891 is based on the increased population shown by the new Census, whereas the rate for 1890 was based on the Census figures of 1881. The provincial rate of 42·8 per 1,000 for 1891 is the outcome of district rates ranging from a minimum of 34·8 in Wun to 47·6 in Akola, a difference which seems to be explicable only by inferring that in Wun the registration has been defective. Among the rural population the rate averaged 43·1, whereas in the towns it averaged only 40·5. In these towns, 33 of which are shown separately, the range is between 61 and 27. This fact alone is strong evidence of neglect in some of them, and the local testing of the registers showed that many births had been omitted. Special attention is drawn to such omissions in the case of three of the most important towns of the province, Amraoti, Akola, and Basim, which all returned birth-rates under 30 per 1,000, although they all have byelaws which make the registration of both births and deaths compulsory. In his orders on this Report the Resident has noted this unsatisfactory state of things and enjoined more careful supervision. It is worthy of notice that errors in the registers seem invariably to be errors of omission. The Sanitary Commissioner observes that "over-statement in the registering of domestic occurrences has never "yet been detected, though under-statement, especially in regard to births, is not unfrequently "met with." In paragraph 6 he has furnished a useful table to exhibit the maximum and minimum birth-rate in the rural circles of each taluk. There can be no doubt that such a statement is a valuable aid in examining the results, and shows at once, as in this instance, where further local investigation is required. In some of the taluks the range between the maximum and minimum birth-rate is very slight, but in others the results are very different. In four of the taluks the range exceeds 10 per 1,000, and in the Chandur taluk of Amraoti it rises to 36·9. According to sex the births of 1891 were in much the same proportion as in 1890, 106 males to every 100 females. Taken by districts the male figure varies between 102 and 109. It only remains to notice in regard to births that in spite of the unhealthiness of the year they outnumbered deaths by 2·2 per 1,000 of the population. This is the result for the province as a whole. Taken by districts, there is considerable variation. In one of them, Ellichpur, there was a slight excess of deaths, while in another, Akola, the births and deaths were almost equal in number.

5. *Deaths.*—The total deaths registered in the province in 1891 exceeded the number registered in 1890 by 22,538. The mortality even calculated on the increased population shown by the Census of 1891 amounted to 40·6 per 1,000, whereas in 1890 on a smaller population it equalled only 35·4. The district ratios in 1891 vary between 30 in Wun and 47 in Akola. There was only a fractional difference in the town as compared with the rural circles taken as a whole. A statement to show the maximum and minimum death-rates in the rural circles of each taluk, similar to that which the Sanitary Commissioner has given in regard to births, would be a valuable addition to future reports. The 33 towns of which the death statistics are separately shown present very marked differences between a minimum of 22 in Basim, and a maximum of 64 in Karanja. In this last town more than 14 per 1,000 deaths were due to cholera; but in others, where the total mortality was also very heavy, only a small part of it was due to cholera. In discussing the town mortality some particulars are given of their sanitary state, and to these we would draw special attention, because they afford excellent

illustrations of the great evils which are connected with high death-rates, and which have to be dealt with in order to prevent the excessive sickness and loss of life which are always going on in them to a greater or less extent. To commence with the town of Karanja, where, as we have just noted, the excessive mortality of 64 per 1,000 occurred in 1891. It is described as an old town, with a population of 14,436. The water supply is brackish, apparently due to a polluted soil; there is no system of drainage, and the latrines are on the well principle, so that the pollution of the soil must be becoming worse and worse. Next comes Talegaon, with a death-rate of 60 per 1,000, of which cholera contributed 11. Here it is reported that surface cleanliness is neglected, house drainage collects in cesspools, outskirts filthy, water brackish, denoting a polluted soil. In Kholapur, where the deaths equalled 54 per 1,000, fevers and bowel complaints were the prevailing forms of sickness. There are numerous well prives, the water supply is contaminated, and the subsoil damp; the water from the wells is so brackish that it is hardly fit to drink. Balapur, where the death-rate was 51, of which no less than 32 is recorded under *Fevers*, is said to be low-lying, surrounded on three sides by rivers which cause damp and give rise to fogs; there are many well prives. In all of the towns which are cited there are very grave sanitary defects which fully explain the great mortality. As was to be expected, with a high death-rate over the province, infants and young children suffered much. The mortality among infants under one year equalled 301 per 1,000, and among children between 1 and 5 it equalled 108.

6. *History of the Chief Diseases. Cholera.*—As has been already noted, cholera was much more prevalent in the Hyderabad Assigned Districts during 1891 than it had been in 1890, and caused 7,958 deaths in the one as compared with 847 in the other; but, great as is the contrast between these two years, the epidemic of 1891 was not nearly so severe as that of some former years. The statistics of 24 years show that, in six of them, the deaths due to cholera exceeded the number recorded in 1891, the maximum of 34,306 having been reached in 1878. On the other hand, the province has frequently experienced much greater freedom from cholera than it did in 1890. In several of the 24 years in question the deaths were limited to one or two, and in 1873 not a single death was registered under this head. The epidemic of 1891 was widely diffused over the province. Every district suffered more or less, and yet in only 532 villages, out of a total of 5,655, were any fatal cases registered. There were no peculiar features in the history of the disease, which merely repeats former experience. It is noted, as the result of the investigations made regarding it, that "local insanitary conditions were generally assigned as the exciting or predisposing cause." No change seems to have been made in the cholera map, which altogether fails to show at a glance where the epidemic was severe, and where it was comparatively light. In former memoranda we have dwelt on the advantage of a map which should, year by year, clearly illustrate the main facts of cholera history as a valuable aid towards a clear apprehension of the facts. In connexion with the statistics of cholera the result of meteorological observations taken at Akola and Amraoti are tabulated, but there is nothing to show in what respect these differed, if they did differ, from the results of ordinary years. Further information regarding the incidence of cholera in 1891 may he gathered from the details given in Annual Form, No. VI., at the end of the Report, in which the death-rate from this cause is tabulated for districts and towns. It will be observed that the place in the whole province which suffered most severely was the town of Karanja, to which, and to its very insanitary condition, reference has already been made. In only two other towns, Telegaon, also already cited in illustration of insanitary conditions, and Hiwarkhed, did the cholera death-rate equal 10 per 1,000. In some of those, even with a considerable population, the number of cholera deaths was small.

7. *Smallpox and Vaccination.*—The history of smallpox during 1891 was very satisfactory. As already mentioned, this was the only great head under which the deaths in that year were fewer than in 1890, and the contrast between the two years in this respect is marked, for whereas there were 324 smallpox deaths in 1890 the number in 1891 was only 34. This is the smallest smallpox mortality which has ever been recorded in the province. The next smallest was 39 in 1880. The maximum 8,369 was recorded in 1872. The statistics bear evidence of the efficiency of vaccination, but, as we have pointed out in noting on several of the sanitary reports, the connexion between vaccination and smallpox is a matter which might be discussed with great advantage year after year as new evidence is available, care being taken to localize the facts regarding both as much as possible. The separate report on vaccination in the Hyderabad Assigned Districts during 1891–92 is a record of much good work done. The number of operations performed had largely increased, with a percentage of success of 95·2 in primary cases and 29·4 in re-vaccinations. The increase in the number of infants and young children successfully operated on is specially important. Out of every 100 persons successfully vaccinated, 82·7 were infants, 16 were children over 1 and under 6 years of age, and only 1·3 of other ages. These results are all the more satisfactory, because special care has been taken to verify them by inspection. Animal lymph was exclusively used during the year.

8. *Fevers.*—Reference has already been made to the increased number of deaths from fevers recorded in 1891, and to the heavy mortality ascribed to them in certain towns. Taking the province as a whole, the deaths under this head rose from 47,894 in 1890 to 49,850 in 1891, though, owing to the change in the population figures on which the ratios are calculated, the fever death-rate for 1891 appears as less than that of 1890, 17·5 compared with 18·2. The district ratios ranged between 11·9 in Basim and 21·3 in Wun. Referring to the figures for the previous 23 years we find that the loss of life from fevers in the Hyderabad Assigned Districts during 1891 exceeded that of every year since 1883, when it amounted to 53,593, the heaviest recorded, with the single exception of 1878, when it reached the maximum of 85,260. We find also that over this series of years the districts preserve much the same relative position in regard to deaths from fevers as they did in 1891, with Wun at the top and Basim at the bottom of the list. In 1890, owing to the epidemic of influenza, the monthly

maximum of deaths took place in April, but in 1891 there was no disturbing element, and the maximum occurred, as it generally does, in the autumn months. A comparison of the particular parts of districts which suffered most from fevers with those which suffered least would be useful. Some interesting details on this point are to be found in the sanitary estimate of villages given in paragraph 27. In the rural circles of the Amraoti district, for example, the fever death-rates range between 9 and 35 per 1,000, in those of Wun between 15 and 38, and in those of Bassim between 7 and 22. There is a discrepancy, we may observe in passing, between the number of circles contained in this sanitary estimate and the number of circles appearing in Tables VII., VIII., IX., and X. at the end. of the Report. In these the total is given as 121, whereas in the sanitary estimate the total is only 97. The two should exactly correspond. We would also suggest that in the estimate the places belonging to each district should be more clearly separated. As it is, they run on so that it is difficult to say what places belong to one district and which to another. Regarding the relation of fevers to localities, we can also study that portion of Table VI. which deals with towns. In many of the towns the death-rate ascribed to this cause was very heavy, such, for example, as 37 per 1,000 at Wadegaon, 33 at Jamod, 32 at Balapur, already noted in connexion with its insanitary condition, and 34 at Burrur.

9. *Dysentery and Diarrhœa.*—The large number of deaths from dysentery and diarrhœa is one of the most marked features of the year, for they amounted to 22,007, the highest figure since 1878, when it reached a maximum of 27,577. In regard to these diseases, also, a more complete examination of their localization would be valuable. In the towns there are remarkable variations under this head from a minimum of *nil* in Wadegaon to a maximum of 17 in Nandura, Pussad, and Kolapur. Doubtless some of those extremes, not only under dysentery and diarrhœa, but also under fevers and other heads, are to be ascribed to error. As the Sanitary Commissioner observes, such errors are unavoidable. An ignorant villager with whom it rests to name the cause of death is certain to make great mistakes. Marked and otherwise unaccountable discrepancies are specially to be found in the deaths ascribed to "Other causes." Under this head, as usual, the Returns for 1891 present extraordinary fluctuations, not only in the districts as a whole but also in the towns—the only localized areas for which they are given separately. In the Wun district the rate was only 4·8, whereas in the Amraoti district it was 14·6. In the town of Sonala, with a population of about 4,500, three persons are registered as having died of "Other causes," whereas in Pathrot, with much the same population, the number was 28, and in the next town, Sirasgaon, which contains only 1,000 more inhabitants, the number was 81. The fact is that, though it is desirable to keep up the few great divisions of common diseases to which deaths are due, little dependence is to be placed on the results which ought to be taken rather as a whole than in its component parts. If the people can only be taught to record the deaths, the main object will be gained, and greater accuracy as to the causes of the deaths may be left to be attained as more medical knowledge becomes available among them. We remarked to much the same effect in our memorandum on the Sanitary Report for 1890, and we recur to it chiefly with reference to what has been said on the subject by the Sanitary Commissioner in this Report for 1891. With his views on the subject we entirely agree. There can be no doubt that the mortuary registration has supplied very valuable information, but, considering the rude machinery with which it is worked, too much must not be expected from it.

10. *Sanitary Defects.*—Some account of the sanitary condition of towns and rural circles is given in the sanitary estimate which appears in paragraph 27, which also contains columns showing the death-rate during the year from smallpox, fevers, and dysentery and diarrhœa. Where the real causes of death are so imperfectly registered, it is important that the total death-rate should also be entered, for, as it is likely to be the most accurate, it is also the main fact to be considered in connection with local conditions. We have already suggested an improved form of this statement for general adoption, and have explained what items of information we recommend it should contain, as may be seen by reference to the last paragraph of our Memorandum on the Report of the Sanitary Commissioner with the Government of India for 1890. The sanitary estimate furnished in this Report of Hyderabad Assigned Districts for 1891 may be divided into two parts, the first including the towns and the second the rural circles, and as regards both many serious defects are brought to notice. To begin with, the 30 towns which are included in this statement, defective drainage is frequently mentioned. In many of them the water is described as "brackish." In many where the supply is drawn from wells, there are also pit privies and cesspools. Most of them are provided with a conservancy establishment of some kind, but in a few there is no conservancy at all. Many of the villages are low-lying and ill-drained; the water supply is frequently brackish and liable to pollution. With rare exceptions they have no conservancy establishment. The Sanitary Commissioner summarizes the results generally in a dreary picture of the sanitary condition of both towns and villages, and ends by saying: "The people are ignorant, apathetic, and filthy in their habits, and no general change is likely to be effected for the better without the element of enforced compliance under legal authority." In this view we do not agree. Progress is certainly slow, and this is, no doubt, disheartening, especially to those on the spot who are actively engaged in carrying out reforms, and who are anxious in their own day to see the fruits of their labours. But the experience of all countries is the same, that in sanitary affairs progress is slow, and that it takes long years before the public generally come to understand the value of such improvements. In Berar and elsewhere in India we doubt not that in time, as the people become better educated and more enlightened, they will be more earnest in their endeavours to improve the conditions under which they live, and remove, as far as possible, those great evils which everywhere exist more or less at present.

11. *Sanitary Works.*—Something has already been done. It is gratifying to learn that the municipalities during the year expended nearly half their income on sanitation, and that in rural circles

Rs. 1,57,618 were expended on the same object, being Rs. 37,997 more than in the year previous. Want of funds seems to be the great obstacle to progress, but, so far as funds are available, there is evidently every disposition to spend them in the way best calculated to improve the public health. The principal work of the year was the completion of the Baldana water supply, which has cost all together nearly Rs. 50,000. In addition to this the water supply of Amaraoti town was immensely improved by extending the catchment area, and a plan of supplying Akola with pure water has been commenced.

12. *Sanitary Boards.*—The working of the District Sanitary Boards during 1891 is not so favourably spoken of as in the Report for 1890. In the Report for 1890 the Sanitary Commissioner remarked the results had so far been " encouraging. Surface cleanliness of village sites is more " general, and the manure heaps, which formerly occupied any spare corner in the street or house " enclosures, are being gradually removed to the outskirts. Boundaries are demarcated generally by " posts, within which people are not permitted to answer the calls of nature. Wells are being " protected, where necessary, by parapets and prickly pear, and other cover removed round villages." All these are simple sanitary reforms, which involve little or no expense, and the execution of which is calculated greatly to improve the public health. But in his Report for 1891 the Sanitary Commissioner observes that " the results of the board's labours show that but little progress has been " made in regard to village sanitation. . . . It is easy enough," he adds, " to demarcate limits, " &c., and to require village sanitary boards to instruct the people to observe those limits, but there is " no means of enforcing compliance, and, as a rule, no attention is paid to the board's instructions. I " was particularly disappointed during my recent tour to find so little improvement in surface " cleansing." On these points, we would draw attention to the following extract of the orders of the Local Government on this Report, in which we entirely concur. They apply, not only to sanitation in Berar, but also to the state of the question more or less in all the provinces of India. "The Resident " is not surprised that Dr. Little should be appalled by the magnitude of the task before him, or that " he should be discouraged by the comparative smallness of the year's outturn of actual work. Rural " sanitation is perhaps the most difficult, and certainly it is not the least important problem of modern " administration in India, and the Resident, therefore, is glad to be able to agree with Colonel " Mackenzie that, although local boards move slowly—and it is to be remembered that they have only " very recently come into operation in Berar—still greater care and attention is being given to sanitary " matters all along the line." It is added that, " If the existing provisions are not found sufficient, or " if they cannot be enforced, the Resident will be prepared to consider proposals for applying a sanitation " law to the province." Among improvements effected during the year, it is to be noted that better means for conserving the water supply have been taken at nine places where fairs are held. The sanitary survey of the province had been continued, and 100 towns and villages were added during the year to the places already included in it.

27th June 1893.

No. 13.

MEMORANDUM by the ARMY SANITARY COMMISSION on the ADMINISTRATION REPORT of the COMMISSIONERS of the TOWN of CALCUTTA for 1891-92.

1. *The Census of* 1891.—There is much that is of interest and importance in this Report, and especially in that portion of it which has been contributed by the Health Officer of the town, and with which we are chiefly concerned. He has stated the facts very clearly and concisely, and has given an excellent review, not only of the events of the year, but also of the recent sanitary history of Calcutta and its suburbs. In our last memorandum we referred to the main results of the Census of 1891, but as the figures as finally corrected have been somewhat altered, and as much additional information of interest has been added, we shall here refer to it again. The population of the municipal area, as extended three years previously, was found on the night of the 26th February 1891 to amount to a total of 681,560, of whom 446,746 were males, and 234,814 females. Thus, out of every 100 inhabitants 64·1 were males, and only 35·9 females. As the areas have been altered, no comparison can be made between these figures and those of the Census of 1881, but if the urban area alone be taken, that is to say, the old town, including the fort and port, the results are as follows :—

	Males.	Females.	Total.
1881 - - - -	288,817	144,402	433,219
1891 - - -	316,667	149,793	466,460

Perhaps the most striking feature in them is, that while the population had increased by 33,241, only 5,391 of this increase were females. It is also noteworthy that the number of infants under one year had diminished.

2. *Analysis of the Ten Years' Statistics in Urban Calcutta.*—With so small a proportion of females, and with the paucity of females most marked at the child-bearing time of life, it is not surprising that the birth-rate in Calcutta has been small. The analysis of the 10-year statistics which Dr. Simpson has furnished is very instructive. Between 1881 and 1891 the deaths have so far exceeded the births that, if there had been no extraneous additions to the population, the Census of 1891, instead of showing an increase of some 30,000, would have shown a decrease of 40,000. Allowing a margin for emigration, which undoubtedly takes place to a considerable extent, it may be estimated that during the 10 years at least 100,000 immigrants must have come to the town. As the Health Officer remarks "Calcutta then owes its maintenance and increase of "population to immigrants. It is peopled at the expense of other parts of India and elsewhere."

3. *Excess Mortality among Females.*—Another remarkable fact which comes out very clearly in the analysis of these 10-years' statistics is the much greater mortality among females than among males. The average of the period is, for males 25·4, and for females 34·5. A similar result comes out not only for the town as a whole, but in each section taken separately. The rates vary greatly. In Shampooker, for example, the female rate is only about 2 per 1,000 above the male rate; in Bamun Bustee it is 16 above the male rate, but in every one of the sections the female rate is the higher of the two. In commenting on the Bombay Municipal Report for 1891 we have drawn attention to the high proportion of female compared to male deaths. In that year the Bombay rates were 23·99 for males, and 37·59 for females, rates which do not differ very largely from the 10-year averages of Calcutta above quoted. In Bombay the Health Officer attributes the excess among females in great measure to child-bearing, but, while admitting that this must have a certain influence, we have expressed doubts as to the adequacy of the explanation, and have recommended further inquiry. The Health Officer of Calcutta suggests another reason, and this is, that females when once they come to Calcutta become more permanent residents, and do not return to the country to die as many of the males do. As respects the movement of population, Calcutta and Bombay seem to have much in common, and to be far more subject to those immigrations and emigrations which have such a vast influence on the vital statistics than Madras, where the birth-rate is double that of either of the other two Presidency towns, and where, though the female mortality is higher than the male mortality, it is only slightly higher.

4. *The Ten-year Statistics in Relation to Sanitary Improvements.*—The Health Officer has discussed the constitution of the population in respect of age, and has shown how necessary it is to consider the statistics both of births and deaths in relation to this most important factor, but we must pass on the practical question, what evidence is there of progress during the 10 years, and how far have the improvements which have been effected influenced the health of the inhabitants? In order to answer this question, the results of the five years 1882 to 1886 are compared with those of the other five, 1887 to 1891, and it is observed that while the first quinquennium exhibits nine wards with a death-rate above 30, the second quinquennium exhibits only three wards with a death-rate above 30. It is said, moreover, that there is a general lowering of the death-rate in all the wards except four, while in seven of them the birth-rate has improved. Summing up the results, Dr. Simpson remarks: "On the whole, therefore, the latter quinquennium has been more healthy than "the earlier one of the decennium. There has been a lower death-rate, a higher birth-rate, fewer "deaths from all causes, and a large decrease in cholera. Much of the decrease in the death-rate, "especially from cholera, may be fairly attributed to the increase in the water supply and the "general improvements which have been carried out by the Commissioners during that period." The comparison would have been more complete and instructive if it had been carried further back, but this can easily be done by examining the figures for a number of years as they are given at page 23 of the Report, and this examination of a series of years, taken one by one, as we have frequently remarked, affords a much more exact, and therefore valuable, basis for comparing results than the averages of a number of years taken collectively. We confess that the figures are disappointing. The ratios are worked for the years 1865 to 1881 on the Census of 1881, and those for 1882 to 1891 on the Census of 1891, and are therefore too favourable to the earlier years of each period. For example, the death-rate of 1882, when the population was doubtless less than it became in 1891, by being calculated on the Census of 1891, is made to appear somewhat less than it ought to be, but taking the figures exactly as they are given, we do not see that marked evidence of improvement which we anticipated. The death-rate of 1891 (27·9) is higher than that of 1882 (27·1), or of any one of the intervening years. It is true that the Returns of the last 10 years as a whole present a favourable contrast to those between 1865 and 1891, but it is very remarkable that within this last-named period the five years 1869 to 1873 yielded better results than any other five years that can be found side by side in the whole statement. Again, it is quite true that the cholera deaths of 1891 (1,553) were less than the mean annual number between 1881 and 1890 (1,656), but if we turn to earlier years we find that in 1880 there were only 805, and in 1871 only 796. We thoroughly believe in the power of sanitary improvements to reduce sickness and mortality, and we are well aware what great efforts the Commissioners of Calcutta have made in this direction, but we must look the facts in the face, and when sickness and mortality are not diminished to the extent anticipated we must ask what disease causes have still to be removed?

5. *The Statistics of* 1891.—The registration of births and deaths in 1861 show a birth rate of 17·6 per 1,000, and a death-rate of 27·9. The manner in which both these rates were distributed in the different sections of the town is detailed in the statement given at page 22. The birth-rate varied from 3·4 in Waterloo Street to 30·4 in Hastings. Some of the more marked extremes are apparently to be accounted for by the varying disproportion between the sexes, but this will not

explain the extraordinary differences in the percentage of male to female births, which range from 10 in one ward to 133 in another, the average being 106. It is, however, impossible to reconcile the entries in the various columns of this statement as regards births. For example, in Fenwick Bazaar Street, where the percentage of male to female births is recorded at the above quoted minimum of 10, it is shown that of the total 298 births recorded the sexes were each represented by one-half—there were 149 male births, and 149 female births, and the same result is set forth in the columns which follow by an "annual ratio of births per 1,000 of population" of 5·2 in each. The percentage 10 would seem to be a misprint for 100, and the percentage 12·5 for Burra Bazar a misprint for 112·5. In the general ratio of mortality for 1891 (27·9) the sexes observe much the same relative position as that which has been already noted as the 10 years' averages, for the death-rate among males was 24·4, and among females 35·2, and similar experience is repeated in respect of every ward, Bamun Bustee showing the maximum excess of 17·6 per 1,000. The total death-rate by wards ranges between 14·9 and 45·4.

6. *The Statistics of* 1891 *in Suburban Calcutta.*—The statistics discussed in the preceding paragraphs concern only urban Calcutta—that is, Calcutta as it was before a portion of the suburbs were amalgamated with the town a few years ago. These amalgamated suburbs continue to be dealt with separately for statistical purposes. The details of both births and deaths within this area are summarized in a statement at page 71. The birth-rate averaged 19·6, fluctuating between 10 in one section and 36 in another. In most of the sections there is much less disparity between the sexes which compose the population of the suburbs than there is in those of the urban area. The percentage of male to female births averaged 110, but this proportion varied between 90 and 129. The mortality was high (39·4), and was higher among females than among males, 42·2 compared with 37·5, but the excess of female deaths is considerably less than the excess of female deaths already noted within the town proper.

7. *Statistics of* 1891 *in Calcutta as a whole.*—There are no statistical tables for Calcutta as a whole. The only figures given would seem to be those at the foot of page 9, where the general birth-rate is shown as 18·3 and the general death-rate as 31·5. It is, no doubt, very important to preserve the statistics of urban Calcutta separate for purposes of comparison with those of former years, but this might easily be done by keeping each statement in two divisions, one for urban and the other for suburban Calcutta, and then giving the general results for Calcutta as a whole in one line at the bottom. A more complete comparison between the vital statistics of the three Presidency towns would then be possible, and it would at the same time be much easier to examine the results in the different sections which make up the whole municipality of Calcutta itself.

8. *Smallpox and Vaccination.*—The various diseases to which the deaths of 1891 were attributed do not call for comment. To the prevalence of cholera in the early part of the year, and its supposed propagation by pilgrims to the Ardhodaya Jog, we have referred already at length in our Memorandum on the Calcutta Report for 1890, and on this subject we have no further remarks to make. Smallpox, which had been epidemic in the previous year, and caused 872 deaths, was represented by only 18 deaths in 1891. Vaccination continued to be actively carried on, though the number of operations performed fell far short of that in 1890, when the prevalence of smallpox induced many grown-up persons to be re-vaccinated and led also to children of very tender age being operated on. We observe, however, that the primary vaccinations of the year did not embrace one-half the births, which amounted to 12,477, while the primary vaccinations numbered only 5,224.

9. *Sanitary Defects.*—In spite of all the improvements which have been effected during recent years the sanitary condition of the town, in the Health Officer's opinion, is "still bad," and this opinion, as we have already shown, is too much in accordance with the facts, as set forth in the mortuary statistics. "Many parts of Calcutta," he says, "are as insanitary as they well could be." One great defect he dwells on is the want of fresh air in the badly ventilated quarters, and this he believes can be remedied by demolition, accompanied "by the enforcement of proper building laws and regulations "which are at present not in existence for Calcutta." Another great defect he notes is, that while an abundant supply of water is pumped into the town, owing to this supply being intermittent, and also to the insufficient number of standposts "inside the bustees, the inhabitants are in much the same "position as before the extension of the supply. They are only able to obtain water from the "stand-posts at a distance. They therefore either store a supply in vessels subject to contamination "or resort to their wells and tanks. The labouring class, who are most affected with cholera, go to "their work before the supply can be obtained from the pipes, and they return to their homes after "that supply has been stopped. The benefit they derive from the increased water supply is "accordingly small." A third great defect which Dr. Simpson insists on is that the sewers when flooded pollute the soil and subsoil water, and also that through the open man-holes they send forth offensive sewer gas into the atmosphere. This is the opinion which Mr. Baldwin Latham formed as the result of his inspection of the Calcutta drainage. In referring to this matter last year, we noted that this opinion was not shared by the Engineer of the Corporation, and we concurred in the view expressed by the Lieutenant-Governor that the leakage from the sewers had been too hastily assumed to be the cause of the great prevalence of fever in 1890, seeing that this prevalence had not been confined to the town of Calcutta but extended to the neighbouring parts of the country, and was really greater in some of the added suburban wards which had no sewers than in the town itself. But if it be a fact that the sewers do leak and allow sewage to permeate into the soil, there can be no question that the defect is most serious, and that steps should be taken to remedy it as soon as possible. There can be no doubt, as the Engineer remarks in his departmental portion of the Report,

that the level of the subsoil water in Calcutta has been materially reduced since the sewers were constructed, and that "the subsoil was permeated more or less with the filth of generations before they were constructed," but it is none the less necessary to remedy the evil if it still exists. The chairman of the municipality in his general report summarizes the whole question, and gives the result of his own personal observations. The conclusions which he has formed are as follows, and in their general application we entirely agree. "The actual facts thus established are, that the older sewers of "Calcutta do pollute the subsoil in their immediate neighbourhood, but the area of contamination "remains still to be determined. My observations did not go to show that the newer sewers do at all "pollute the subsoil, but on the contrary, the only two sewers laid within the last nine years, one "in 1883 and the other in 1886, that I examined, were found to be well laid and thoroughly "water-tight. I have also watched the laying of very many pipes for the last two years, and they "have all been properly jointed. All pipes that have been laid since Mr. Baldwin Latham wrote "his report have been jointed in the manner recommended by him. It seems to me that I should be "wanting in my duty if I did not here record my conviction that it will be henceforth the duty of "the Commissioners to set aside yearly a considerable sum of money till they have cemented all the "joints of all the old sewers. It has been objected that such a course would inevitably raise the "level of the subsoil water. That may be so or not. I have given considerable attention to the "point, and am by no means convinced that such would be the result. But whether the subsoil "water is raised or lowered thereby, there can be no doubt that the joints of the old sewers, like the "joints of the new, should be water-tight."

10. *Sanitary Works.*—During the year sanitary work continued to make good progress, both in the recently acquired suburbs and also in the town. On the former Rs. 851,071 were expended, a considerable part of which was devoted to the extension of the water supply and to drainage. Several bustees within this added area have also been taken up for improvement. Within the town itself this work of bustee improvement has been carried on with energy, and a better out-turn obtained than in any former year. Connections for filtered water to bustees which were formerly disallowed have now been allowed on certain scales which have been freely taken advantage of, and bustee owners have also had permission to erect covered reservoirs for filtered water, so that the defects consequent on the intermittent supply which we have noted in a previous paragraph may be obviated. Sixteen tanks were filled up during the year. Several structural improvements have been carried out in the streets, which have led to clearances and provided for better ventilation. An incinerator, for the disposal of refuse, on the most approved pattern, was on the point of completion. These, and other items that might be mentioned, are ample evidence of the energy which the Commissioners have brought to bear during the year on the works required for the improvement of the health of the town.

18th July 1893.

No. 14.

MEMORANDUM by the ARMY SANITARY COMMISSION on the ADMINISTRATION REPORT of the MADRAS MUNICIPALITY for 1891–2.

Want of Uniform Plan in Presidential Reports.—We shall deal with the health portion of this Report under similar headings to those we have adopted in noting on the sanitary condition of the various provinces of India. The Health Officer of the municipality contributes a special account of the cholera epidemic of 1891, and this forms one of the appendices; but the general sanitary history of the year, including the results of registration of births and deaths, the mortality from different diseases, the defects in the condition of the various quarters of the town, and the measures which are being taken to remove them, are all dealt with in the President's general report. It would simplify matters very much if some general scheme of report were adopted for all the three Presidency towns, more especially as regards the statistical tables, which are now very voluminous, very various in design, and therefore very difficult of comparison. The uniformity which has been secured in the provincial sanitary reports has proved to be of great practical value, for it aids materially in finding information on any particular point and in understanding it when it has been found. We have referred to this matter before, and trust that the suggestion may be adopted.

2. *The Census of* 1891.—The Census of 1891 is employed as the basis of the statistics of the year, but very little is said of the results of that census, nor is it shown how far those results accord with the figures deduced from the birth and death registration during the intermediate years on the Census of 1881. It appears from the statistical tables in the appendix that the population of Madras on the 26th February 1891 numbered 452,518, and that it was composed as follows :—

Europeans, East Indians, and Native Christians	39,742
Hindus	358,997
Mahomedans	53,184
Others	595

From another table we learn that the sexes were very equally divided, there being a small excess of females. The exact numbers were, males, 225,817; females, 226,701; while as regards the children there were in the total population of 452,518, 13,667 infants under one year, and 41,016 children of one and under five years of age. In comparing the birth-rate and death-rate of the three Presidency towns the figures showing the compositions of the population in each are of great importance.

3. *Registration of Births.*—Great pains have evidently been taken to ensure a more accurate record of both births and deaths. Orders were issued that "every case of birth and death must be verified "and registered," and the result was that "in spite of the unusually large number of deaths during "the year there were only 26 unregistered cases against 411 in the previous year;" of these 26 unregistered cases in 1891, 22 were deaths and four were births. The constant inspection of the burial grounds must serve as an excellent check on the death records, but it is not clear what procedure was adopted as a check on the birth registration. So much pain, however, has been taken in order to obtain accurate data that we turn with more than ordinary interest to the statistics of the year. The live births numbered 18,061, or a ratio of 39·9 per 1,000. Among classes this ratio varied between 40·4 for Hindus, 38·9 for Mahomedans, and 37·3 for Europeans, East Indians, and Native Christians taken together. It seems a mistake, we may remark in passing, to join these three together, seeing that the differences between them are so marked. Even though the numbers are small, it would be better to take each separately. According to divisions the rate ranged between 34·2 and 46·5. In all but one of them the male births were in excess. In this case the male births were 96·6 to every 100 females. In the others they ranged from 102·3 to 123·1. Such variations in the provincial reports would be looked on as indicating neglected registration, but there is still much to be learnt regarding vital statistics in India.

4. *Registration of Deaths.*—The year was signalized by very heavy mortality, equalling 52·6 per 1,000. It affected all classes, reaching a maximum of 59·6 among Mahomedans. Among Hindus it was 52·5, and among Christians 44. It was also very general over the town, varying from 43·3 in the 5th division to 72·8 in the first. In the 5th division alone were the births more numerous than the deaths, and that to the extent of only ·5 per 1,000. Fevers, dysentery, diarrhœa, and cholera are the heads under which the mortality increased largely on that of the year previous. Another striking feature in the mortality is the enormous proportion that fell on the children. This is not unusual in Madras. Indeed, the rate for 1891 is considerably under that of some previous years; but it is still very high, amounting as it does to 427·5 for infants under one year and to 90·5 for children between one and five years of age. The excessive infant mortality of Madras is being inquired into by the Sanitary Commissioner. The variations in the ratios for the different quarters of the town afford a basis for such an investigation, for we observe that they run between 351 and 559 per 1,000 for infants under one year.

5. *Causes of High Mortality.*—Of the general causes at work in producing the high mortality of the year, one of the most prominent was the high price of food. The ordinary labourer in Madras has but little to spare even in the best of times, and in 1891 the purchasing power of the rupee was reduced by one quarter. Cholera and fever, to whatever cause or causes they may be primarily due, found a population ill fed, and, therefore, ill able to resist. As we have already seen in the Sanitary Report for Madras, unusual causes of disease and death were not confined to the town of Madras, but were widely spread over the Presidency. But in the town there were superadded, or, at all events, intensified local conditions to which much of the death-rate must be ascribed. The remarks of the President of the municipality on the subject are so important that we shall quote them in full. "The great difficulty," he says, "in dealing with the problem of Madras sanitation lies in the fact that the "high death-rate is not the result of any one cause, but of a conjunction of nearly all the causes that "affect mortality all over the world. To enumerate them as shortly as possible, the more important "ones are an indifferent water supply, defective drainage, and over a considerable portion of the "municipality no drainage system at all, a porous soil loaded with organic impurity, a putrid and "fluctuating subsoil water rising comparatively near the surface, want of open spaces in some parts "of the town, crowded *parcherries* for the poor, overcrowded and ill-ventilated houses for the middle "class, in many cases directly connected with the subsoil water by wells in their interior, burial "grounds and slaughter-houses in the city, and, lastly, the general social conjugal and religious habits "and customs of the people. These are matters which can only be remedied by a heavy expenditure "of money and years of systematic and patient work."

6. *History of the Chief Diseases. Cholera.*—This disease was epidemic and caused 1,916 deaths—the largest number recorded since 1876 and 1877, which were years of famine. The statistics which the Health Officer furnishes in his special Report show that during the 10 years previous, the cholera mortality had varied from a minimum of 4 deaths in 1886 to a maximum of 1,193 in 1884. In 1891, as already stated, even this maximum was exceeded, and, coincident with considerable privation among the people, the deaths numbered 1,916. These fluctuations are very remarkable, but they are not particular to Madras, and are to be found more or less in every part of India. The Health Officer believes that the disease was imported into the town, and much of his Report is devoted to evidence under this head, and also to an account of the measures of isolation and disinfection which were adopted to check it. Much might be said on both these questions, but it will suffice to point out, as regards the first, how inadequate the incidents mentioned are to account for the facts. Not only was cholera present all over the town of Madras, as may be seen both by the statistics and the map, but it rose and fell in all the divisions of the town at or about the same time. Nor were the general epidemic causes

at work confined to the town of Madras. They embraced a much wider area, as may be seen by comparing the cholera deaths in Madras itself, and in the neighbouring districts in 1890, with those recorded in 1891. They stand thus:—

DEATHS REGISTERED FROM CHOLERA.

	1890.	1891.
Chingleput	410	4,985
North Arcot	2,304	7,355
Salem	2,548	5,896
South Arcot	2,043	16,096
Madras	744*	1,916*

That such great differences in the two years as occurred in these districts were dependent on some great general cause or causes operating over a wide area is manifest.

7. *Measures taken for the Prevention of Cholera.*—But the second point to which we have referred is the real practical question—What can be done to prevent cholera? The Health Officer describes what was done in Madras during 1891. The measures which he advocates, and which were, as far as practicable, carried into force, were the removal of the sick as soon as their cases were known, their isolation, disinfection of all articles that had come in contact with them, and even the burning of the huts they occupied when these were composed of inflammable materials. There is nothing to be gained by discussing this procedure from a purely theoretical point of view. The only practical way of dealing with it is to test it by the results. Was it successful? The reply must be that it was not, but that, on the contrary, these steps altogether failed to check the epidemic. It may be argued that, but for them, many more cases would have occurred, but there is no evidence on which to support such an assertion. On the contrary, we know that in spite of all these measures cholera added much more to the mortality of Madras during 1891 than it did in former years when no such measures were adopted. But if there be no evidence that the measures did good, there is ground for believing that, at least in India, the country with which we are now concerned, they have really done harm. Experience has shown that in India, the fear of being forcibly removed from their homes induces panic among the people, that it leads to concealment of the early symptoms which alone are amenable to treatment, and that the mere fatigue inseparable from removal is attended with great risk to the sick person. It is clear, from the Health Officer's own account, that the measures adopted were very unpopular, and that, in some instances, the sick had to be carried off by force in direct opposition to their own and to their friends' wishes. Such action is sure to be resented, and to set the people against everything done in the name of sanitation. The only real preventive to be adopted in Madras, as elsewhere, is to remove the many insanitary conditions in which, as may be seen from the remarks of the President of the municipality already quoted, the place abounds, to provide pure water, to cleanse the polluted subsoil, to establish a thoroughly efficient system of conservancy, and to improve the dwellings, especially of the poorer classes. These, no doubt, are great and costly objects for which time and money are required, but it is therefore all the more necessary that nothing should be wasted on measures which experience has proved can end only in failure.

8. *Smallpox and Vaccination.*—The work done by the vaccinators seems to have been very good and complete, for it appears to have included every infant available for operation. The Returns are for the year 1891-92, and show a total of 26,493 operations, of which 25,084 or 97·72 were successful. In primary cases the very high proportion 99·45 cases per 100 is recorded. It does not appear how far the results have been verified by inspecting officers. In paragraph 161 of the Report it is said that 24 deaths from smallpox occurred during the year, but in paragraph 170 the number is given as 66, and from the statistics in the appendices this last would seem to be the correct figure. According to either, the mortality was very small. There was no local outbreak of any importance. The largest number of deaths in any one quarter of the town was 25 in the first division out of a population of 71,587, and these were spread over 9 months out of the 12.

9. *Fevers.*—The mortality recorded under this head was very heavy, and equalled 15·6 per 1,000. The number of deaths from this cause rose from 4,685 in 1890 to 6,731 in 1891. There seems some doubt as to whether part at least of this mortality was not due to influenza, but if influenza had really been prevalent, it would almost certainly have shown itself among the European or other portion of the community where it would have been recognized. From the table given at page 52, it is shown that in 1891 not only were fevers much more fatal in Madras as a whole than any one of the preceding nine years, but that the same remark applies to each class taken separately. Among Christians the rate was 10·5 per 1,000, the previous ratios having varied between 3·7 and 8·6; among Hindus 14·8, previous ratios having varied between 7·5 and 10·4. Among Mahomedans the rate was 18·5, previous records having varied between 4·8 and 11·1. If the results for 1891 be taken by localities, the maximum mortality of 21·3 was reached in the first division, which it may be remarked leads the way under all the main headings, and the minimum of 12·6 in the fifth division.

* The figures for Madras do not agree with those in the Sanitary Commissioner's Report.

10. *Sanitary Defects.*—Of these some mention has already been made in a general way, but it is instructive to note more particularly what is said of each division of the town in connection with the mortality in it. The first division, which, as already noted, was the most unhealthy in 1891, and where the death-rate has attained the very high figure of 72·8, contains "some of the largest *parcherries* " in the municipality, with wretched huts huddled together, in some cases on a soil that, after a " shower of rain, forms a slough of liquid filth." The people are poorer and felt the high prices more acutely than in other parts; only a part of the division is drained, and that imperfectly, and the Red Hills water is obtainable there only in early morning. In the third division, which comes second, with a death-rate of 56·7, the main evils are overcrowding, contaminated soil, and putrid subsoil water. Of the fourth division, which stands next, with a death-rate of 51·4, parts are described as " low and " swampy, with pools of filthy stagnant water." It contains some filthy *parcherries*, has little drainage, and is very partially supplied with Red Hills water. Part of the population is very poor. In spite of overcrowding and smells, the seventh division returned the lowest mortality, 45·9, but even this is a very high rate. The information given regarding these local conditions is very valuable as the first step towards their improvement. It would make the facts of the case still more clear if the maps given at the commencement of the Report to indicate the incidence of cholera, were also employed year after year to show what parts of the town are drained, and also what parts are served by the Red Hills waterworks.

11. *Sanitary Works.*—In view of the many and grave sanitary defects under which the town of Madras labours, it is disappointing to find that more progress in the great work of improvement was not effected during 1891. On the Black Town drainage, owing to the delay in acquiring the necessary land, little was done, and only one-fifth of the money available was spent. On minor drains and repairs much the same amount was expended as in the year previous. The improvement in the water supply, which is so much needed, has still to be undertaken in earnest. The quality of the Red Hills supply is indifferent, and the quantity so insufficient that it was found necessary to stop all further connections with private houses for the present. Projects for a new water supply are being carefully considered, and a special tax on tobacco has been levied in order to provide funds for the purpose.

18th July 1863.

No. 15.

MEMORANDUM by the ARMY SANITARY COMMISSION on the ADMINISTRATION REPORT of the MUNICIPAL COMMISSIONER of BOMBAY for the year 1891–92.

1. *The Census of* 1891.—We shall note briefly on a few points connected with this Report, and more especially with that portion of it which deals with the health of the city. In doing so we shall, for the sake of convenience, follow the same order of subjects as we adopted last year. According to the corrected figures, the population of Bombay, as deduced from the Census of 1891, amounted to 821,764, of whom 518,093 were males and 303,671 females. More particulars as to the changes which have taken place in the population during the preceding 10 years would have been of interest, such as the changes in the proportion of the sexes, in the proportion of children of all ages, and in the proportion of the people in different wards. In 1881 the population had amounted to 773,196, of whom 464,763 were males and 308,433 females. It would thus appear, that while there had been an increase in the population as a whole in 1891, there had been a decrease in the number of females. All these points have an important bearing on the vital statistics, and are therefore deserving of special attention in the Health Officer's Report. It would also have been of interest to know what results were to be obtained from the registration of births and deaths during the 10 years, 1881 to 1890. Adding all the births and deducting all the deaths registered during that period, how far does this product agree with the figures obtained from the Census of 1891, and how are the discrepancies in the different wards to be accounted for?

2. *Births.*—The number of births recorded during 1891 was much the same as in the year previous. Excluding still births they amounted to 15,518, or a ratio of 18·88 per 1,000. According to classes there are some remarkable results.* Omitting the communities whose numbers are small, the range extends between 7·97 among Brahmins and 31·72 among low caste Hindus. No explanation is given of these extremes. According to localities the results are equally striking, as the rate varies between 5·56 and 48·41. Here again a more detailed examination of the figures would have been of value. In some instances it would seem that the marked variations are to be explained by the varying disproportion of the sexes, but in others no such explanation holds good.* This disproportion between the sexes which, as has been already seen, has been somewhat intensified since the Census of 1881, is a noteworthy feature in the statistics of Bombay, and necessarily affects the birth-rate to a large extent. For every 100 females, according to the last census, there were 170 males; but this disparity, great as it is, becomes greater still in its influence on the births when we examine the number of males and females at different ages. From the table given at page 413 to show the mortality from fevers at

* In the penultimate column of the statement, at page 427, by mistake "Deaths" have been printed instead of "Births."

different ages, we find that in the earlier years there is very little difference between the two, and that it is during the child-bearing period of life that the disproportion is most marked. At some of the periods given in the table the number of males is more than double the number of females. In these respects the city of Bombay affords a marked contrast to Madras, for there the females are in excess, and instead of a birth-rate of 18·8 as in Bombay, we have a birth-rate of 39·9, or more than double. The figures, as respects both births and deaths in the two stand thus:—

	Population. Census of 1891.			Rate per 1,000 of Population.				
	Males.	Females.	Total.	Births.	Deaths.			Mortality among Infants under 1 Year.
					Males.	Females.	Total.	
Madras	225,817	226,701	452,518	39·9	50·9	54·2	52·6	427·5
Bombay	518,093	303,671	821,764	18·8	23·9	37·5	29·01	293·3

3. *Deaths by Class and Sex.*—In commenting on the Report for 1890–91 we drew attention to the high ratio of deaths among females as compared with males. In the year 1890 the figures were 23·40 for males and 31·30 for females. In 1891 the difference is still greater, for the male rate is 23·99 and the female rate 37·59, or an excess mortality among females of 13·60 per 1,000. The Health Officer attributes this to the several causes which tell heavily against female life, especially hard toil, poor nourishment, overcrowding, "the impurities of overcrowding, and conditions and diseases "connected with and arising out of child-birth." In nearly every one of the Sanitary Reports of Indian provinces the male mortality recorded is in excess of the female mortality, but the greatest difference is not more than 4 per 1,000. In Coorg, where registration is still very imperfect, we have the solitary instance of a province returning the deaths among females in higher proportion than among males, but the excess is only 1 per 1,000. In Bombay, as already stated, the excess female mortality amounted in 1891 to 13·60. In the town of Madras, as shown in the statement which we have given in the last paragraph, the death-rate of 1891 was exceptionally heavy, and females suffered more than 3 per 1,000 in excess of males. The causes which the Health Officer assigns for the high death-rate among females in Bombay no doubt have their influence, but they are insufficient to explain the results, because the same influences are at work more or less all over India. Further inquiry on this point would seem to be required. Among classes also the death-rate was very unequally distributed. The average for the city was 29·01, but its components varied from 18 among Europeans to 42 among Jains and low-caste Hindus. Among Mussalmans it was 38, and among Hindus of other castes only 25.

4. *Deaths according to Age.*—Among infants under one year the Bombay rate of mortality was 293·3, a considerable advance on 262·45, the rate for 1890, but very much less than 427·5, the ratio for Madras as shown in the foregoing table. At page 392 of the Report a statement is given to show the death-rate from all causes at different periods of life, and similar statements illustrate the mortality from the chief diseases. Taking the deaths from all causes, the female mortality exceeds the male mortality during every one of the sixteen periods entered except four, and in some the excess is great, especially at the child-bearing time, as may be seen from the following comparison of some of them:—

Period.	Mortality.	
	Males.	Females.
10—14 years	4·67	13·78
15—19 „	8·48	22·23
20—24 „	9·85	20·30
25—29 „	10·48	20·58

It is difficult to separate any one factor, such as age, or sex, or disease, from locality, and to attempt to say how far that factor taken by itself can be held responsible for the results, and hence the importance of endeavouring to do what we have suggested in previous memoranda, to take all of them together as far as possible, and show the population in each ward according to age and sex and at the same time consider with these data the records of deaths, and the causes to which they are assigned.

5. *Deaths according to Causes.*—The higher mortality of 1891 was spread under a large number of heads, as may be seen from the following comparison of the ratios with those of 1890:—

Diseases.	Number of Deaths.		Ratio per 1,000 of Population.	
	1890.	1891.	1890.	1891.
Small-pox	150	108	·18	·13
Measles	179	614	·22	·75
Fevers	6,489	6,837	8·01	8·32
Cholera	102	164	·12	·20
Phthisis	2,728	3,132	3·37	3·81
Diseases of the nervous system	1,936	2,447	2·39	2·98
„ „ respiratory system	3,335	4,379	4·12	5·33
Diarrhœa	905	1,029	1·12	1·25
Dysentery	507	472	·63	·57
Accidents	397	364	·49	·44
All other causes except still-born	3,806	4,301	4·70	5·23
Total	20,534	23,847	25·35	29·01

For both years the ratios have been calculated on the Census of 1891, and we have added the actual number of deaths in each year to admit of another and more easy mode of comparison. It will be seen that the greater death-rate of 1891 was not due to the prevalence of any epidemic or other particular disease. The more unhealthy character of that year is manifested by increased mortality under many heads. Of the 11 heads under which the deaths are distributed, smallpox, dysentery, and diarrhœa each show a slight diminution. Under all the others there is an increase, but in none of them does it much exceed 1 per 1,000.

6. *Deaths according to Locality.*—The mortality from all causes in each section of the city is detailed at page 399, and the same statement is reproduced in full in Appendix C, at page 587, with changes in the spelling of some of the localities which are confusing. Kamathipura returns the highest death-rate, 44·41. In the Water Division it was only 3·02, and between these extremes there are many gradations. Of the 33 localities 11 return a death-rate of over 30 per 1,000. At page 397 a statement is given, in which the deaths in some of those wards where the mortality was highest are divided according to diseases and other causes to which they were assigned in the registration records. In all of them fevers head the list, and after fevers the most noteworthy causes of death are phthisis, diseases of the nervous system, and diseases of the respiratory system. It would be well if a summary of this kind were given, including all the wards of the town, so that the proportions in which the different causes contributed to the death-rate in each might be seen at a glance. The more we deal with the health reports of the great presidential cities of India, the more we are impressed with the great advantage that would be gained if a few simple standard forms were devised for showing the annual statistics of births and deaths in each of them. Much needless space is now taken up with unnecessary details. For example, in this Bombay Report the population of the city by wards is repeated a dozen times. Much time is occupied in looking for information desired, and when the needful data seem to be forthcoming, there is no guarantee that they have been compiled on the same system in all the three, so that comparison cannot be made with any degree of confidence. The object is to ascertain the facts bearing on the local prevalence and causes of disease, in order that these causes may be dealt with as far as possible, and everything that helps towards this most desirable object is of importance.

7. *Local Sanitary Defects.*—The Kamathipura section it appears is inhabited to a large extent by the poorest of the population, and among them the Health Officer believes that the most potent causes of disease are overcrowding, imperfect ventilation and imperfect house drainage. The place was in former days a swamp, which has been filled up with city refuse, and the people here live over this decomposing soil. A large proportion of them occupy ground floors, and the locality is densely populated. Here are a number of concurrent conditions most unfavourable to health. Great improvements it appears have been effected in this quarter during the last 20 years—improvements in drainage and in air spaces, but, as the Health Officer remarks, further improvements are much required. Kamathipura presents the highest death-rate, and also furnishes the most striking illustration of local insanitary conditions, but in some of the other quarters there are still formidable evils to be dealt with. In Parel there are "pools of sewage amidst dwellings, polluting ground and air, and "oozing to lower levels, often beneath dwellings." In Byculla there is "still sewage in ditches "and lanes." In Second Nagpada house crowding is noted as the main defect. In three of these sections the mortality was heavy. The rates were for—

Kamathipura	44·41
Parel	43·21
Second Nagpada	42·41

8. *History of the Chief Diseases.*—The history of the chief diseases in Bombay during 1891 calls for no special comment. Measles was prevalent in certain quarters, but it added little to the general mortality. In connection with the few deaths from smallpox, it may be noted that according to the Returns vaccination was carried on with great vigour and success, but some explanation is required of the fact that the number of infants under one year who were operated on

(16,662) is nearly 1,000 in excess of the total births recorded (15,518). This may have been due to imperfections in the birth registers, or infants residing elsewhere may have been brought into Bombay to be vaccinated. No reference is made to the discrepancy, nor is it said how far the Vaccination Returns are verified by inspection. Cholera numbered 164 victims, compared with 102 in the year previous, but the death-rate due to this disease, equalled only ·20 per 1,000 throughout the city. It is gratifying to learn that in Fanaswadi, a quarter which formerly suffered much coincidental with sanitary improvements, not a single death was recorded during the year.

9. *Leprosy.*—The Health Officer mentions that 106 deaths from leprosy were registered, and adds that "with the collection of lepers in the leper house we must expect more correct registration of "deaths from leprosy, and therefore a larger number of deaths referred to and registered from "leprosy." A considerable portion of the Commissioner's Report is devoted to an account of this leprosy home, and of the reasons which led to its establishment, and occasion is taken to record a dissent from the remarks on the question which we offered in our memorandum on the Bombay Municipal Report for 1889. It is necessary for the right understanding of the matter that we should recall the circumstances under which our remarks were made. The Health Officer, in his Report for that year, stated that in his opinion leprosy was very seriously increasing, because lepers were under no restraint, and were propagating leprosy in the town. He therefore recommended that, in order to prevent this propagation of the disease, the lepers should be compulsorily segregated, and the Commissioner in his general Report suggested, with reference to the Health Officer's remarks, that it might perhaps be found necessary to guard the approaches of the city "so that persons found "to be suffering from a dangerous or infectious disease, or from leprosy, may be intercepted and "taken to a dhurmsala or to a leper asylum for treatment or disposal." The only point we had to consider was whether such measures were likely to reduce leprosy or the other diseases against which they were directed. We came to the conclusion that they were not, and that in any attempt to carry them out much mischief must be done. We are still of the same opinion. The Commissioner in his Report for 1891–92 evidently wrote under the impression that measures of the kind which Bombay approved would be recommended by the Leprosy Commission, and that special legislation by the Government of India would speedily follow in this direction, but the Leprosy Commission seem to have arrived at the same practical conclusions that we had already formed. We observe, in connexion with this question, that a difference of opinion had arisen between the Corporation and the Government of Bombay regarding "hospital accommodation for the reception and treatment of persons suffering from dangerous diseases," which the Government demanded but the Corporation was unwilling to supply. As no particulars are given, there are not materials for forming an opinion on the case, but, as a matter of general principle to which we attach the greatest importance, we may say that, in deciding what is the best course to pursue for the furtherance of sanitation in India, too rigid regard ought not to be had on all points to procedure which has been adopted in England. To attempt anything like the "notification of infectious diseases" in an Indian city would lead, we believe, to no good result, while it would certainly tend to make all the work of the Sanitary Department unpopular. Independent of all other objections, there is no machinery for carrying out such a system, and the attempt to enforce it must prove a failure.

10. *Sanitary Work.*—The Engineer's Report shows that good progress continued to be made in sanitary work. It having been decided to maintain the drainage outlet at Worli, arrangements have been made to supply the pumping station at Love Grove with entirely new machinery. Several new latrines and urinals have been erected, and fair progress made in house connections. As regards water supply, the great event was the completion and opening of the Tansa Works, which will supply from 20 to 21 millions of gallons daily to the city of Bombay. In the Health Officer's Report incidental reference is made to several important improvements effected during the year. In Parel, for example, the sewage ditch near the Chinchpoogly station, which had been noted on in the previous year as "festering and corrupting" had been removed. In Byculla progress is reported, and nuisances have been abated. It is by such work that the health of the city will be improved.

18th July 1892.

REPORT

ON

SANITARY MEASURES IN INDIA

IN

1892-93.

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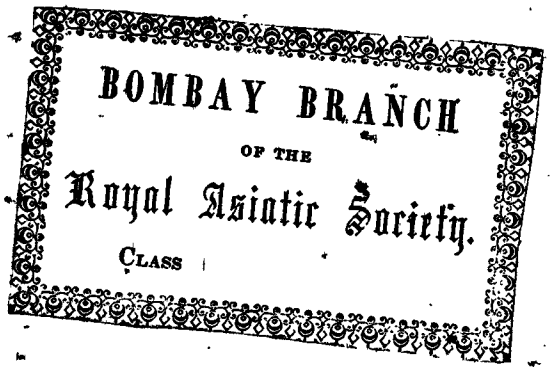
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A. GODLEY,
Under Secretary of State for India.

INDIA OFFICE,
24th October 1894.

REPORT.

I.—EUROPEAN ARMY.

The present Report on Sanitary Measures in India during the year 1892 is prepared for presentation to Parliament. It contains chapters on the health of the European and Native Troops, on the health of prisoners in jails, and on the health of the general population; it also contains chapters on vaccination, on medical institutions, including medical schools and lunatic asylums, and a chapter on sanitary works. Appended to the Report are abstracts of reports by the three principal Sanitary Commissioners in India, and memoranda by the Army Sanitary Commission in England reviewing the several Sanitary Reports for India.

Sickness and mortality in 1892.

There was more sickness among the European troops on service in India during 1892 than in the previous year, the mortality was also greater. Of an average strength of 68,137, the admissions into hospital were in the ratio of 1,517 per 1,000 against 1,379 in 1891, the daily sick-rate was 84 or 5 per 1,000 more, and the death-rate rose from 15·89 to 17·07. The loss by invaliding was 24 per 1,000, or 3 per 1,000 less than in 1891, bringing the total loss by death and invaliding up to 41 per 1,000, a decrease of 2 per 1,000 on the previous year.

The following statement shows the relative extent of sickness and mortality among European troops in the three Presidencies during 1892 and the previous year :—

Presidency.		Average Strength.	Ratio per 1,000 of Average Strength.				
			Admissions.	Daily Sick.	Deaths.	Invaliding.	Total Loss.
Bengal	1892	42,198	1,582	87	19·81	23	42
	1891	40,994	1,394	80	16·86	25	42
Madras	1892	13,227	1,236	83	12·32	33	45
	1891	13,324	1,304	82	14·49	31	46
Bombay	1892	12,712	1,593	74	12·90	21	34
	1891	12,713	1,409	73	14·24	29	43
India	1892	68,137	1,517	84	17·07	24	41
	1891	67,030	1,379	79	15·89	27	43

It will be seen from the above statement that of the three armies Bengal continued to be the most unhealthy. The chief causes of sickness in the whole European Army were, as in the previous year, ague and venereal diseases, the former yielding a ratio of 429 per 1,000 against 343 in 1891, and the latter 410 per 1,000 against 401. More than half (55 per cent.) of the total sickness resulted from these two causes. Influenza was present among the troops to a much greater extent than in 1891, and caused an admission rate of 12·7 per 1,000 against 5·5. Enteric fever, as usual, was the chief cause of mortality, and the death-rate from it was 5·52 per 1,000 against 5·73 in 1891. Cholera was much less prevalent, there being 167 admissions in 1892 against 252 in 1891, and 121 deaths, equal to 1·78 per 1,000, against 168 or 2·51. Enteric fever caused 32 per cent. and cholera 10 per cent. of the total deaths.

Bengal Army.

In the Bengal Army the admission rate rose from 1,394 per 1,000 in 1891 to 1,582, the daily sick-rate from 80 to 87 per 1,000, and the death-rate from 16·86 to 19·81. Ague and venereal diseases were the chief causes of admission to hospital, contributing 30 and 26 per cent. respectively of the total sickness. The chief cause of mortality was enteric fever, with a ratio of 6·40 per 1,000 against 6·64 in 1891. Under this one head alone 32 per cent. of the total deaths occurred. Cholera mortality among the Bengal troops declined from 114 or 2·78 per 1,000 to 102 or 2·42.

Madras Army.

Though there was a slight increase in the number of constantly sick in the European army of Madras in 1892 as compared with the previous year, both the admission and

death rates showed a decrease, the latter declining from 14·49 per 1,000 to 12·32. As in Bengal and Bombay venereal diseases and ague caused the majority of the admissions, the former yielding 34 per cent. of the total admissions and the latter 13 per cent. Among the death causes enteric fever was the chief, contributing 26 per cent. of the total deaths against 21 per cent. in 1891, dysentery followed with 10 per cent.

Bombay Army. In the Bombay Army there was increased sickness owing to influenza and malaria, but a much lower mortality than in 1891, the death-rate being 12·90 per 1,000 against 14·24. Chief among the diseases causing admissions were ague and venereal diseases, together yielding 58 per cent. of the total. Of the deaths 39 per cent. resulted from enteric fever, and 7 per cent. from cholera.

Groups of stations. The following table shows the sickness and mortality among the European troops in the new groups:—

Groups.	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admission Rate.	Constantly Sick Rate.	Death Rate.
Burma Coast and Bay Islands	1,620	1,349	92·6	7·41
Burma, Inland	2,453	1,589	91·7	18·75
Bengal and Orissa	2,274	1,602	97·6	11·43
Gangetic Plain and Chutia-Nagpur	7,337	1,617	104·7	17·04
Upper Sub-Himalayan	13,632	1,704	88·5	22·01
Indus Valley and North-Western Rajputana	5,155	2,009	89·0	31·81
South-Eastern Rajputana, Central India, and Gujarat	6,045	1,816	91·0	14·72
Deccan	9,621	1,220	72·3	11·64
Western Coast	1,383	1,599	85·3	11·57
Southern India	3,491	1,161	86·8	10·31
Hill Stations	9,190	1,147	66·8	12·84
Hill Convalescent Depôts	2,644	1,199	84·0	22·69

Of the above 12 groups, all but two returned a higher constantly-sick rate than the ratio for the whole European Army, the highest being 104·7 per 1,000 of average strength in the Gangetic Plain and Chutia-Nagpur group. Bengal and Orissa followed with 97·6, and Burma Coast and Bay Islands with 92·6. The lowest ratio (66·8) was returned by the Hill Stations group. The death-rate of the entire Army was exceeded by four groups, the Indus Valley returning the highest (31·81), followed by Hill Convalescent Depôts (22·69); that of Burma Coast (7·41) was the lowest.

Of the stations with a strength of over 1,000, six returned a higher death-rate than that of their Presidencies, viz., Peshawar 56·74, Meean Meer 38·24, Bareilly 28·39, Karachi 18·96, Poona 13·71, and South Secunderabad 13·32.

Cholera. Notwithstanding the exceptionally high mortality from cholera among the civil population during 1892 the disease was less prevalent among the European troops than in 1891. The admissions to hospital from cholera numbered 167, or 2·5 per 1,000 of average strength, against 252 or 3·8 per 1,000, and the deaths 121 or 1·78 per 1,000, against 168 or 2·51 in 1891. Among the troops in the Bengal Army there were 143 cases of the disease with 102 deaths, the latter being in the ratio of 2·42 per 1,000 of strength, against 114 deaths or 2·78 in 1891. The Madras Army recorded only 8 cases of cholera, of which 7 proved fatal, the deaths being in the ratio of 0·53 per 1,000. In the Bombay Army the cases of cholera declined from 53 to 16, and the deaths from 33, or 2·60 per 1,000, to 12 or 0·94.

Small-pox. Among the whole of the European troops in India there were during the year under notice 18 cases of small-pox, of which three were fatal, one in Madras, and two in Bombay. In the previous year there were only 14 cases and one death.

Fevers. From intermittent fever the admissions to hospital among the European troops in 1892 were in the ratio of 429 per 1,000 of strength against 343 in the previous year. The deaths under this head numbered 19, an increase of seven on the mortality of 1891. Of these, 10 occurred among the Bengal troops, and eight among the Madras troops.

From enteric fever the admissions rose from 1,366, or 20·4 per 1,000 of strength, to 1,509 or 22·1, and the deaths fell from 384, or 5·74 per 1,000, to 376 or 5·52. Of the three armies, Madras was the only case in which the mortality under this head was higher than in 1891, the other two armies showing a slight decrease. The Bengal Army recorded an enteric fever death-rate of 6·40 per 1,000 against 6·64 in 1891, the Madras Army 3·18 against 3·08, and the Bombay Army 5·03 against 5·58. As usual, young and unacclimatised soldiers were the chief sufferers, those under 25 years of age yielding a death-rate of 8·44 per 1,000 against 9·11 in 1891, while among men between 25 and 29, and from 30 to 34, the mortality was 2·92 and 1·65 per 1,000 respectively. Among men of less than two years' residence in India, the death-rate from this cause fell from 11·60 to 10·69 per 1,000, among men of three to five years from 3·64 to 3·56, and among troops of from six to ten years from 2·23 to 2·15. Enteric fever again formed the subject of investigation on the part of medical officers, but no satisfactory results were obtained as to the origin of outbreaks. "As in former years," Dr. Rice, Sanitary Commissioner with the Government of India, observes, "medical officers were "unable, even to their own satisfaction, to trace out in any given outbreak a definite "insanitary condition to which the outbreak might, with certainty, be attributed." Some interesting remarks regarding the opinions of bacteriologists on the diagnosis of this disease will be found in the abstract of Dr. Rice's report, pp. 52 and 53.

Bowel complaints.

The admissions from dysentery and diarrhœa among the European troops were in the ratio of 59 per 1,000 of strength or one per 1,000 less than in 1891, and the death-rate 0·72 against 0·52. As in the previous year, there were no deaths from diarrhœa in the Madras Army, but dysentery was more prevalent than in either the Bengal or Bombay Armies.

Venereal diseases.

Venereal diseases came next to ague in the list of causes of admission to hospital, and first in the causes of invaliding. They were the cause of 27 per cent. of the total admissions during 1892, and 13 per cent. of the invaliding of the European Army of India. The ratio of admissions from venereal diseases per 1,000 of strength was 410, or nine above that of 1891. The increase was confined to Bengal and Madras. In Bengal the admission-rate rose from 395 to 412 per 1,000, in Madras from 402 to 415, while in Bombay the ratio fell from 417 to 396. As regards the voluntary venereal arrangements, in connexion with the new cantonment hospitals, medical officers, Dr. Rice says, now take a much less sanguine view of the good to be effected by them, "because they find that the women, having quite come to realise that no one can force "them to come and be cured, have nearly given up attending."

Invaliding.

The loss to the whole army by invaliding during 1892 amounted to 1,661 men, equal to 24·37 per 1,000, against 1,793 or 26·78 in 1891. The proportion of invalids to strength was least in Bombay (21·33 per 1,000) and highest in Madras (33·05), that of Bengal being 22·57. Of the total number invalided, 40 per cent. were discharged as unfit for further service, being 6 per cent. more than in 1891. As regards the influence of age and length of residence in India upon invaliding, 53·41 per cent. of the total number invalided were under 25 years of age, against 54·01 in 1890, while 35 per cent. were of less than two years' service, and 77 per cent. were of less than five years' service. In the European Army as a whole, 79 per cent. of the total strength had seen less than five years' service.

II.—NATIVE ARMY.

Sickness and mortality in 1892.

The health of the Native Army of India during 1892 was, on the whole, less satisfactory than in the previous year. There was more sickness owing to the prevalence of influenza and malaria, but the mortality was reduced.

The ratios of sickness and mortality of each section of the Native Army of India for 1892 and the previous year are given in the following table :—

		Average Strength.	Ratio per 1,000 of Average Strength.			
			Admissions.	Daily Sick.	Deaths.	Total Deaths, including Absentees.
Bengal Native Army	1892	65,594*	1,234	40	16·53	19·70
	1891	66,230	1,021	35	17·32	18·10
Madras ditto	1892	25,963	868	38	18·53	26·00
	1891	26,088	1,017	46	20·05	27·28
Bombay ditto	1892	23,355*	1,130	34	10·10	12·48
	1891	23,780	978	31	9·63	12·34
Corps of Central India and Rajputana	1892	5,128	777	21	9·56	10·50
	1891	5,175	629	20	7·73	8·96
Hyderabad Contingent	1892	7,058	681	22	7·08	8·35
	1891	7,063	529	19	6·09	7·83
INDIA	1892	127,355	1,092	37	14·97	18·67
	1891	128,600	972	35	15·44	19·34

* Excluding the statistics of the mixed troops at Panjgur and on the march.

As usual the Hyderabad Contingent and the Central India Irregular Force were the healthiest branches of the Native Army. The Bengal Army returned the highest sick-rate, and Madras the highest mortality.

The chief cause of sickness in the Native Army was ague, which yielded 48 per cent. of the total admissions. Among the diseases from which the admissions to hospital were higher than in 1891 were influenza, small-pox, "other fevers," respiratory diseases and ague, while from cholera, diarrhœa, and guinea-worm, there was a decrease in the admissions. Pneumonia and cholera were the chief causes of death in the Native Army, the ratios being 3·26 and 2·14 per 1,000 respectively of average strength, against 2·53 and 2·64 in 1891. Under these two heads, 36 per cent. of the total deaths were registered. Fevers of all kinds were the cause of 17 per cent. of the total deaths, against 41 per cent. among the European troops. From ague, remittent and simple continued fevers, the deaths among the Native troops were in the ratio of 2·45 per 1,000, while among the European troops the proportion was 1·42. On the other hand the death-rate from enteric fever among the Native troops was only 0·13 per 1,000 as compared with 5·52 among the European troops. Native troops seem to be more liable to dysentery than European troops, for while among the former this disease caused 6·4 per cent. of the total deaths, among the latter it was the cause of only 3·7 per cent. of the deaths. But of all diseases, those of the respiratory organs are the chief causes of death in the Native Army. From pneumonia the mortality of Native soldiers (3·26 per 1,000) was more than five times as great as that of European troops (0·62 per 1,000).

Bengal Native Army.

The health of the Native Army of Bengal in 1892 was not so good as in 1891. There was considerably more sickness, but the death-rate fell from 17·32 per 1,000 to 16·53. Ague prevailed to a much greater extent, and caused 51 per cent. of the total admissions. Pneumonia and cholera were the chief causes of death, the former yielding over 25 per cent. of the total deaths, and the latter 16 per cent.; the cholera death-rate was 2·58 against 3·73 in 1891.

The following statement gives the principal statistics of the Native Army, arranged in geographical groups for 1892 :— Groups of stations.

	Average Strength.	Ratio per 1,000 of Average Strength.		
		Admissions.	Daily Sick.	Deaths.
Burma Coast and Bay Islands	1,777	1,343	75	23·07
Burma, Inland	7,146	1,365	57	29·67
Assam	2,515	1,823	72	21·87
Bengal and Orissa	2,922	1,206	57	9·24
Gangetic Plain and Chutia-Nagpur	6,667	790	29	8·10
Upper Sub-Himalayan	16,942	1,000	37	16·53
Indus Valley and North-Western Rajputana	16,374	1,645	45	21·80
South-Eastern Rajputana, Central India, and Gujarat	13,951	1,041	29	7·88
Deccan	19,076	789	28	7·55
Western Coast	3,632	641	24	5·78
Southern India	8,276	526	27	14·38
Hill Stations	16,118	1,391	45	19·67

In six of the above groups the daily sick-rate was in excess of the ratio for the whole Native Army; and in six groups the death-rate was higher. The highest mortality was that of the Burma Inland group (29·67), which, however, was a considerable reduction on its rate (40·79) of the previous year.

The health of the corps of Central India and Rajputana (average strength 5,128) was worse than in the previous year. The admission-rate rose from 629 to 777 per 1,000, and the death-rate from 7·73 to 9·56. Ague was the cause of 48 per cent. of the total sickness. Cholera and pneumonia were the principal death causes, the former having accounted for 26 per cent. of the total mortality and the latter 24 per cent. Corps of Central India and Rajputana.

The health of the troops composing the Hyderabad Contingent also was not so good as in 1891. Of an average strength of 7,058, the admissions to hospital were equal to 681 per 1,000 of strength against 529, and the death-rate was 7·08 against 6·09. Ague was the chief cause of sickness, yielding 36 per cent. of the total sickness; and cholera, pneumonia, and injuries were the principal causes of mortality, yielding 24, 22, and 18 per cent. respectively of the total deaths. Hyderabad Contingent.

The returns of the Madras Native Army show an improvement in the health of the troops. The ratio of admissions to hospital per 1,000 of an average strength of 25,963 was 868 against 1,017 in 1891, the daily sick-rate was 38, or 8 per 1,000 less, and the death-rate fell from 20·05 to 18·53 per 1,000. Ague caused 39 per cent. of the total sickness. From cholera there were 59 deaths, equal to 2·27 per 1,000, against 52 or 1·99 in 1891. Cholera caused 12 per cent. of the total deaths, pneumonia nearly 12 per cent., debility 11 per cent., and ague 10 per cent. Of the Native troops on service in Burma and the Andamans during 1892, the Madras Army furnished about 84 per cent. Among this portion the admissions into hospital were in the ratio of 1,349 per 1,000, the constantly sick-rate 57, and the death-rate 29·12, all showing a considerable reduction on the ratios of the previous year. Madras Native Army.

The health of the Bombay Native Army in 1892 was not so good as in the preceding year. Of an average strength of 23,355 the admissions to hospital were in the ratio of 1,130 per 1,000 against 978 in 1891, the daily sick-rate was 34, or 3 per 1,000 more, and the death-rate 10·0 against 9·63. Ague caused 50 per cent. of the total sickness. Pneumonia was the chief cause of mortality, contributing 26 per cent. of the total deaths. Bombay Native Army.

III.—GENERAL POPULATION.

Vital statistics.

Births were registered throughout all the 10 provinces of India in 1892, and the birth-rates varied between 22·12 and 39·9 per 1,000 of population under registration. The best results were obtained in Berar, the Central Provinces, and in the Punjab, their respective birth-rates being 39·9, 38·39, and 38·16; the North-Western Provinces and Oudh came next with 36·17; Bombay, 34·57, and Assam, 31·05. In all provinces except Bengal, the Punjab, Assam, and Coorg, the birth-rate exceeded the death-rate. The year was far more unhealthy than 1891, and the recorded deaths rose from 5,885,539 or 28·42 per 1,000 of registered population in 1891 to 6,920,816 or 32·47. Of the chief diseases, cholera was again very prevalent, and the total number of deaths from it were 724,015, being the highest figures recorded in any year since 1877, and an increase of 141,585 on the deaths from the disease in 1891. Every province contributed to the increase except Madras, Assam, and Berar, but especially Bengal, the North-Western Provinces and Oudh, and the Punjab. In Bengal and the Punjab the number of cholera deaths was the greatest on record. There was a considerable increase also in the deaths from fevers, which were more prevalent in all the provinces except the Central Provinces and Berar, and in most provinces caused more deaths than all the other causes put together. On the other hand, the mortality from small-pox and dysentery and diarrhœa was lower.

The deaths from the chief diseases and from all causes in the several provinces were as follows:—

	Cholera.		Small-pox.		Fevers.		Dysentery and Diarrhœa.		Deaths from all Causes.		
	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000.	Total Deaths.	Ratio per 1,000 of Population under registration.	
										1892.	1891.
Bengal, excluding Calcutta	259,398	3·68	22,359	0·31	1,607,716	22·84	48,491	0·68	2,247,275	31·92	26·94
Calcutta	2,019	2·95	21	0·03	7,618	11·17	2,364	3·46	20,180	29·60	27·94
North-Western Provinces and Oudh	194,886	4·15	7,709	0·16	1,168,077	24·90	42,448	0·90	1,600,053	34·11	31·14
Punjab	75,959	3·70	11,173	0·54	715,890	34·83	21,781	1·06	1,017,023	49·48	29·13
Lower Burma	6,208	1·38	1,463	0·32	44,422	9·84	5,449	1·21	90,233	20·00	15·93
Central Provinces	39,972	4·21	995	0·10	188,017	19·79	16,021	1·69	324,348	34·14	32·98
Coorg	58	0·33	913	5·27	3,459	19·98	289	1·67	5,299	30·62	21·79
Assam	21,552	4·29	1,452	0·29	93,971	18·72	15,685	3·12	171,784	34·21	29·91
Madras	79,033	2·3	43,757	1·3	280,627	8·3	32,293	1·0	750,755	22·3	22·2
Bombay	42,900	2·28	2,770	0·15	438,038	23·27	35,406	1·88	611,742	32·50	27·26
Berar	2,030	0·7	68	0·02	41,661	14·6	11,200	3·9	82,124	28·8	40·6
Total	724,015	3·39	92,680	0·43	4,589,496	21·06	231,427	1·06	6,920,816	32·47	28·42

Bengal.

Important changes in the registration of vital statistics in Bengal were introduced at the commencement of 1892. Births were registered not only in urban areas, but for the first time in the whole province, and the work of registration was entrusted entirely to the police. Improved results are already visible, "and it is now expected," the Government of India remark in their orders on the Sanitary Commissioner's (Dr. Gregg) report, "that Bengal will no longer remain one of the most backward "of the provinces of India in the very important matter of reporting births and "deaths." During the year 1,981,960 births were registered, equal to a birth-rate of 28·15 per 1,000, which is a great improvement when compared with 21·46, the average rate of the municipalities in 1891. Dr. Gregg, however, believes that these figures represent very imperfectly the true rate, which he estimates at something over 40 per 1,000. Compared with the statistics of other provinces the birth-rate of Bengal was the lowest with the exception of Madras and Burma. Out of the 558 rural circles in Bengal which profess to register births, only 27 returned birth-rates over 40 per 1,000, and of the 145 towns this ratio was reached only in three.

The year was exceptionally unhealthy in the province, and from all the chief diseases a higher mortality was recorded than in 1891. The number of deaths registered in 1892 amounted to 2,247,275, equal to 31·92 per 1,000 of population, against 1,896,261 or

26·94 in the previous year. In every month except December the mortality showed an increase as compared with 1891. Usually the most unhealthy period is from October to January, but in the year under notice the worst months were March and May. This Dr. Gregg attributes in a great measure to the drought of the previous months, "which diminished and deteriorated the already scanty and impure water-supply, and considerably lowered the vitality of the people." The district death-rates ranged from 43·62 in Backergunge, and 43·60 in Balasore, to 19·34 in Singhbhum. The provincial rate of mortality was exceeded in 25 of the 46 districts. Among infants the mortality was higher than usual, being in the ratio of 168·29 per 1,000 of living, against 132·95 in 1891, and 113·52, the average of the quinquennium 1887–91.

Cholera was unusually prevalent during the year, 259,398 deaths having been recorded, against 229,575 in 1891, which was itself the worst year since 1876. The death-rate was 3·68 per 1,000 of the population, or 0·42 in excess of the rate of 1891. The epidemic in the year 1891 was attributed chiefly to the Ardhodya Jog fair. The Army Sanitary Commission stated their reasons for doubting this conclusion, "and the experience of 1892," they say, "affords additional and very strong grounds "in support of what we then wrote, for in 1892 there was no such fair to which "the results can be ascribed, and yet the cholera of that year was even worse than "it had been in 1891." The disease was present in every district and in every month of the year, and as usual affected urban more than rural circles in proportion to population, the average death-rate of the towns being 5·05 per 1,000, and of the districts exclusive of towns 3·62. The period of greatest intensity was from March to June. The disease advanced in severity from the beginning of the year and reached its maximum in May, when 56,280 deaths were recorded; it receded rapidly with the outset of the rains in October, rising again in November.

The most remarkable feature in the cholera history of the year was the excessive mortality in the Balasore, Puri, and Cuttack districts of the Orissa division, which were comparatively free from the disease in 1891, and the immunity of the Purnea, Rangpur, and Jalpaiguri districts which suffered most severely in 1891. In the three districts of the Orissa division the cholera death-rates rose from 2·06, 1·09, and 1·72, respectively to 15·00, 11·30, and 10·98, while in Purnea the rate declined from 11·08 to 0·14, in Rangpur from 9·36 to 0·28, and in Jalpaiguri from 9·93 to 0·59. The increase in the cholera mortality was generally attributed to the deficient rainfall in the earlier months of the year, which caused wells and tanks everywhere to run dry, and drove the people to drink impure water. "Many Civil Surgeons," Dr. Gregg states, "refer the origin of cholera to importation by human intercourse "from places said to be suffering from the disease, but to its almost simultaneous "appearance in many centres in a district there is no satisfactory explanation given, "nor is the strange exemption of certain areas environed by cholera considered and "discussed. On the whole, however, the evidence goes to show that the best "preventive is the possession of a good water-supply. This is in accordance with "my own experience and the experience of sanitary officers all over India."

The mortality from small-pox, though insignificant as compared with that from other diseases, was the highest on record since 1882. The number of deaths reported from the disease was 22,359 or 0·31 per 1,000, against 16,193 or 0·23 in 1891. As in 1891 the prevalence of small-pox was practically limited to Orissa, Chota Nagpur, and Midnapore, where, owing to the strong prejudices of the people, vaccination has not made much progress. It is expected that under the new decentralisation scheme (referred to at p. 22), by which Civil Surgeons have been made directly responsible for the vaccinations of their districts, these backward parts of the province will be efficiently protected, and enjoy the same degree of immunity from small-pox as the rest of the province. Nearly 66 per cent. of the small-pox deaths occurred among children under 12 years of age, the mortality among infants under one year being in the proportion of 17·18 per cent. of the total small-pox deaths, among children from one to six years 31·18, and from six to twelve years 17·60. "Nothing could show "more clearly than these figures," Dr. Gregg remarks, "the necessity that exists for "increased vigilance on the part of the Vaccination Department."

Fevers also prevailed much more extensively and proved considerably more fatal during 1892 than in any year within the past decade. The deaths registered under this head amounted to 1,607,716 or 22·84 per 1,000, against 1,333,395 or 18·94 in 1891, and a 10 years' average rate of 15·17 per 1,000. "The increasing mortality "from this cause," Dr. Gregg writes, "is truly lamentable. . . . Ever since I "have held the office of Sanitary Commissioner, *i.e.*, for the last five years, I have

" never lost an opportunity of impressing upon district officers, district boards, " municipalities, and the Government, that the principal causes which are operating " to produce this high and increasing rate of mortality are obstruction to drainage " and bad drinking water, and that until the one is removed and the other improved, " there is no hope of a diminution of a death-rate from this disease which is nearly " three-fourths of the entire death-rate of the province, and represents only about a " twentieth part of the sufferings of the people." In six districts the fever mortality exceeded 30 per 1,000 (Rajshahi recording the highest rate of 37·13) all of which were the most fever-stricken districts in 1891, and in 10 others the death-rate was above 25 per 1,000. Orissa division, which suffered most severely from cholera and small-pox, was singularly free from fever, the death-rate being only 12·70 per 1,000. Dr. Rice, Sanitary Commissioner with the Government of India, reports (Abstract, p. 92) that with a view to lessen the suffering from periodic fever under which the people of Bengal labour, a scheme was put into practice at the close of the year by which quinine can be purchased in five grain doses in most of the post offices of the provinces for one pice a packet, and according to the latest information the plan had been favourably patronised by the people.

The registered mortality from dysentery and diarrhœa was 48,491 or 0·68 per 1,000 of population, against 43,183 or 0·61 in 1891. As usual Darjeeling district recorded the highest death-rate from these causes of 5·57, followed by Balsasore, Puri, Howrah, and Lohardaga, with rates of 4·69, 3·56, 3·81, and 3·26.

The health of Calcutta, including the suburbs, during 1892 was again unsatisfactory. The registered deaths fell from 21,157 or 31·5 per 1,000 to 20,180 or 29·60. From cholera the deaths fell from 2,953 to 2,019. The deaths from fevers numbered 7,618 or 11·17 per 1,000, against 7,851 in 1891; from small-pox there were 21 deaths against 13, and from dysentery and diarrhœa 2,364 against 2,716.

North-Western Provinces and Oudh.

On the whole the general results of the registration of births and deaths in the North-Western Provinces and Oudh during 1892 show that real progress is being made in this important work. " Ordinary statisticians in England," the Sanitary Commissioner, Dr. Hutcheson, says, " are scarcely aware of the fact that nearly every birth " and death occurring throughout the United Provinces, with a population much in " excess of the United Kingdom, is registered in writing with a certain amount of " care by a more or less responsible, although unprofessional, agency." The registered births numbered 1,696,427 or 36·17 per 1,000 of population, against 1,559,888 or 33·26 in 1891. The district birth rates ranged from 20·45 per 1,000 in Dehra Dun to 46·35 in Moradabad, the extremes being at greater variance than in the previous year. The births exceeded the deaths by 96,374. The year 1892 was an unhealthy one, and the registered deaths rose from 1,460,732 or 31·14 per 1,000, to 1,600,053 or 34·11, an increase of 139,321, the greater part being due to the extraordinary prevalence of fevers, especially in the months of March, April, and May, when a very high temperature was recorded, and to a severe cholera epidemic. According to districts the death-rates varied in relation to the incidence of cholera, the highest (52·35) being recorded by Naini Tal, and the lowest (23·13) by Ghazipur. It is noticed, however, that with an increase in the provincial death-rate there was a considerable decrease in the town and municipal death-rate, especially in cholera mortality, as compared with rural tracts. " Extensive sanitary works," Dr. Hutcheson remarks, " are undoubtedly effecting a marked change for the good in the health of the urban " areas," and the Army Sanitary Commission have no doubt that this improvement will become more and more apparent as these works extend.

Cholera was again epidemic in the province, and the mortality from the disease was the highest on record except that of 1887. The deaths rose from 169,013 or 3·60 per 1,000 in 1891 to 194,886 or 4·15. All the districts suffered from the disease, and among those showing exceptional mortality were Dehra Dun 18·13 per 1,000, Garhwal 14·57, and Bahraich 13·80, and in four others, Bara Banki, Almora, Gonda, and Hardoi the cholera death-rate exceeded 10 per 1,000. Of the total deaths, two-thirds (129,066) took place in the three months of April, May, and June. The epidemic showed signs of decreasing virulence in November, which became more evident in December. As already stated the municipal towns experienced a marked immunity from the disease, their average rate of mortality being 1·99 as compared with the provincial general ratio of 4·15 and the rural ratio of 4·31. The Hurdwar fair of 1892, unlike that of the previous year, was attended with a serious outbreak of the disease. It broke out on the 22nd March, a few days before the

great bathing festival, and the assemblage of 70,000 was dispersed. It is estimated that 200,000 persons on the move by rail and road to the fair were stopped *en route* and ordered to return to their homes. The same precautionary measures were taken as on the previous occasion, except that "the sending of a constant stream of fresh "water all through the bathing pool, which removed all impurities very quickly, was "less effectively applied than in the former year," owing to a lessened volume of water in the river and to the obstruction of the current by impediments which have since been removed. The Army Sanitary Commission doubt whether the difference in the results of the two years can be so explained, considering "that specimens of the "water from the bathing pool in 1891 on examination were declared to be teeming "with what were pronounced to be cholera bacilli." As regards the theory that the disease was disseminated by the dispersed pilgrims, the Commission point to the monthly statistics in each district as evidence of the inadequacy of the theory. "Any "arrangements for the suppression of cholera," they say, "which are based on "endeavours to prevent personal contagion must end in failure, especially in a "country like India where such arrangements are simply impossible. The only "refuge is to be found in sanitary improvements, especially in securing a good whole-"some water supply, and we are glad to see that in the North-West Provinces all "the authorities concerned are fully alive to the importance of such improvements." Towards the close of the year a committee of experts, assisted by native gentlemen, was appointed to advise the Government on the remedies to be applied to meet such evils as the pollution of the water in which the pilgrims bathe, and overcrowding, and to report on the practicability of providing Hurdwar with pure drinking water, and also to make any other suggestions for the health, comfort, and convenience of the pilgrims at future fairs.

Owing to the great progress in vaccination in the province the mortality from small-pox fell to the lowest figure on record, only 7,709 deaths having been recorded from this disease, equal to 0·16 per 1,000, against 26,355 or 0·56 in 1891. Though all the districts were affected, in no instance did the death-rate from the disease reach 1 per 1,000, and it is worthy of notice that only one death was registered in the Cawnpore district, with a population of nearly a million and a quarter, only three deaths in Meerut district and two in Lucknow, with populations of 1,391,458 and 774,163 respectively.

The deaths registered under fevers numbered 1,168,077 against 1,033,059 in 1891. and the death-rate rose from 22·02 to 24·90. Dr. Hutcheson again points out, that this mortality represents deaths from a great variety of causes, of which fever may or may not be a symptom, and he reckons the actual fever mortality at 30 per cent. of the total deaths, instead of 73 per cent. as the general returns indicate. Among districts, Naini Tal recorded the highest fever death-rate of 41·22 per 1,000, followed by Saharanpur with 36·34, and ratios of over 30 per 1,000 were also noted in the districts of Meerut, Muzaffarnagar, Bulandshahr, Bahraich, and Kheri.

From dysentery and diarrhœa there were 42,448 deaths registered against 49,586 in 1891, and the death-rate declined from 1·06 to 0·90. As usual the mortality was highest in the hill tracts, the two districts of Garhwal and Almora having recorded death-rates under this head of 7·62 and 6·02 respectively. Dehra Dun followed with 3·85.

Punjab.

More births were recorded in the Punjab during 1892 than in any year since the registration of births was commenced (in 1880), except 1884. The number registered was 784,356, giving a birth-rate of 38·16 per 1,000, against 699,242 or 34·02 in 1891. The Sanitary Commissioner attributed the improved birth-rate partly to the year 1891 having been a fairly healthy one, and partly to greater accuracy in registration. The district birth-rates ranged from 50·80 in Sialkot to 15·12 in Simla. In the frontier districts the birth-rate, though still low, showed a decided improvement generally.

The year under notice was exceptionally unhealthy in the Punjab. An epidemic of cholera travelled through the province, and was succeeded by an outbreak of malarial fever of a serious nature, caused by the exceptionally heavy rains. The registered deaths amounted to 1,017,023 or 49·48 per 1,000, against 598,789 or 29·13 in 1891, showing an increase in 1892 of 418,234 or 20·35 per 1,000. The death-rate exceeded the birth-rate by 11·32 per 1,000, and the number of deaths was greater in all the districts but two, Gurgaon and Jullundur, in which the birth-rates were only 0·71 and 0·23 per 1,000 respectively higher than the death-rates. In every district of the province, with the exception of Simla, the registered death-rate was higher than the average rate of the previous five years. Of the 31 districts in the province only two returned a death-rate of less than 40 per 1,000. The districts

of Bannu, Gurdaspur, Sialkot, Montgomery, Shahpur, and Mooltan, recorded the highest mortality, their ratios being 66·69, 63·18, 62·44, 57·85, 56·58, and 56·38 per 1,000 respectively. The abnormally high mortality in the province was due principally to excessive outbreaks of fever, cholera, and influenza. No less than 40 per cent. of the total deaths were recorded in the months of September, October, and November. The death-rate among the infant population was excessively high, aggregating nearly 30 per cent. of the children born during the year.

Of the chief diseases, cholera, which appeared in epidemic form in the province for the sixth year in succession, accounted for 75,959 deaths, equal to a death-rate of 3·70 per 1,000, as compared with 10,107 or 0·49 in 1891. Every district suffered, the highest ratio registered being 11·36 per 1,000 in Bannu; Kurnal, Montgomery, and Hissar followed with ratios of 8·72, 7·36, and 6·83 respectively. In the remaining districts the ratios varied between 6·67 in Kangra and 0·42 in Muzaffargarh. The Sanitary Commissioner, Surgeon-Colonel Stephen, attributes the severity of the outbreak and the rapid diffusion of the disease to returning pilgrims from the Hurdwar fair; but in discussing this matter the Army Sanitary Commission notice that many of the districts in the immediate vicinity of Hurdwar suffered very little, while Bannu, one of the most remote districts, was the chief sufferer. "Even if it were proved "beyond all doubt," the Commission remark, "that the pilgrims were the cause of the "epidemic, what is to be done? Are all fairs to be stopped, or are the people to be "taught to seek security by keeping the pilgrims at a distance? To stop the fairs "is hardly to be thought of. To teach the people that safety is to be found in "avoiding others and especially those that are sick, is calculated to do much harm, "because it diverts their attention from those sanitary improvements which are so "necessary for the public health. Nothing has done so much to check such improve-"ments as quarantine. Countries which have trusted to the delusive protection "which quarantine promises have neglected to deal with the real causes of disease "existing in their midst, and have continued to suffer. The same must be the result "of all teaching of a similar character to the people of India."

From small-pox 11,173 deaths were registered, yielding a ratio of 0·54 per 1,000, against 3,426 or 0·17 in 1891. The district of Bannu again recorded the highest death-rate from the disease of 4·08; Kohat, Peshawar, and Ludhiana, followed with respective death-rates of 2·45, 1·81, and 1·23 per 1,000, and the remaining district rates ranged from 1·00 in Simla to 0·004 in Jang and Gujranwala. Special means have been taken to reduce the mortality from small-pox in the province. When it is observed from the weekly death returns that an outbreak of the disease has occurred in any place, the attention of the Civil Surgeon is called to the point, and if the outbreak occurs during the vaccination season he is requested to have as many unprotected persons vaccinated as possible, and to have re-vaccinations done in suitable cases.

The mortality recorded under fevers was lamentably high, the deaths amounting to 715,890 or 34·83 per 1,000, against 442,254 or 21·52 in 1891, and a five years' average rate of 23·27. The fever death-rate was therefore nearly ten times as high as that from cholera, and this notwithstanding the year was the worst on record for that disease. With the exception of Gurgaon the recorded mortality from fevers was higher in all districts than the average rate, and in some cases the excess was very great. Gurdaspur, with a fever death-rate of 49·53, suffered more than any other district, the neighbouring district of Sialkot coming next with 44·70, and Bannu, Mooltan, Dera Ismail Khan, and Muzaffargarh, following with rates ranging from 43·58 to 41·17 per 1,000. The great majority of the deaths were of malarial origin and occurred in the last four months of the year. As regards the causes of this excessive prevalence of fever, the Sanitary Commissioner says the comparative scarcity of food, which was experienced in many places, was doubtless a predisposing cause for the severe outbreak which occurred in the last four months of the year, but the principal cause was the excessive rainfall of the third quarter of the year. In the flat Punjab plains, it is observed, heavy rains soon cause floods, and when this is succeeded by a high temperature a severe outbreak of fever invariably follows. The chief remedy is efficient drainage, and, as far as funds will permit, schemes were being gradually carried out to obtain better drainage in the water-logged tracts. Other means were also being taken with a view to preventing a recurrence of such an appalling fever mortality.

Under dysentery and diarrhœa 21,781 deaths were registered, equal to 1·06 per 1,000 of population, against 12,152 or 0·59 in 1891. The districts of Guadaspur and Sialkot, which recorded the highest fever mortality, also returned the highest death-rates from dysentery and diarrhœa, viz., 2·45 and 2·27 respectively.

Registration of vital statistics in Burma during 1892 was again confined to the lower portion of the province, and the Chief Commissioner considers that it may with advantage be postponed in Upper Burma districts for a few years. The results show an improvement on those for 1891, though they are still far from satisfactory. It is stated that rules for the registration of vital statistics have now been made by all the municipalities except one in Lower Burma, and that in each town a special staff is entertained for the purpose. The total number of births registered in 1892 was 112,070, or 24·83 per 1,000 of population, as compared with 95,332 or 20·74 in the previous year. In the different districts the birth-rate ranged from 18·36 in Shwegyin to 37·44 in Sandoway. For the whole province the excess of births over deaths was 5 per 1,000, but in the Hanthawaddy and Akyab districts the deaths were in excess of the births, a result due to the preponderance of the male sex among the large population of Indian inmigrants in the towns of Rangoon and Akyab in these districts. Deaths were registered to the number of 90,233 or 20·00 per 1,000, against 73·190 or 15·93. The district rates of mortality varied between 29·91 in Akyab and 12·55 in Tavoy. Of the total deaths more than one-fifth (18,849) were children under one year old. **Burma.**

All the chief diseases contributed to the excess mortality of the year. Cholera caused 6,208 deaths, being in the ratio of 1·38 per 1,000 of population, against 2,400 or 0·52 in 1891. Every district was affected except Tavoy and Mergui, their immunity being attributed to their isolated position, as in the previous year they were almost free from the disease. Over a fourth of the deaths occurred in Akyab district, the number being 1,592 against only 12 in the previous year. Cholera was present in the province during each month of the year. The largest number of fatal cases (858) was registered in April, and the smallest (105) in December. But although the disease was peculiarly fatal throughout the province, the mortality from this cause in some towns, especially Rangoon, Prome, and Thaton, where the water-supply arrangements are satisfactory, was inconsiderable. Out of 17,414 villages only 8½ per cent. registered cholera deaths.

There were 1,463 deaths from small-pox registered in the province, yielding a rate of 0·32 per 1,000, against 1,326 or 0·29 in 1891. No deaths from this cause were recorded in the Sandoway, Mergui, and Toungoo districts, and in several others the mortality was very low, while, on the other hand, considerably more than a half (824) of the deaths occurred in Akyab. Of the total number of those who died from small-pox, 979 were under 12 years of age, and of these 274 were infants. The Sanitary Commissioner, Surgeon-Major Dalzell, says that small-pox is extensively propagated in the province by inoculation, and that the people having a deep-rooted faith in it, as soon as the disease makes it appearance the inoculators are busy at work, with the result that in a short time it is spread over a large area. The Army Sanitary Commission, however, do not think the facts warrant this theory, as small-pox was very widely spread over the province, existing in several districts the whole year and in others for a great part of the year, while nowhere was there any violent local outbreak of the disease.

The registered deaths from fevers were 22 per cent. in excess of any other year, and almost equalled the aggregate number of deaths from all other causes taken together. In the year under notice 44,422 fever deaths were recorded, equal to a rate of 9·84 per 1,000, against 35,658 or 7·76 in 1891. The increase was distributed throughout the whole province, but the chief sufferer was the Arakan division, where fever was the cause of 10 out of every 17 deaths. The highest rates of mortality under this head were returned from the three districts of this division, viz., Akyab 18·21, Sandoway 15·16, and Kyaukpyu 14·64. These high ratios were attributed to the unhealthiness of the division. "The very heavy rainfall and the water-logged condition of the low "country, are," the Sanitary Commissioner states, "I think sufficient to account for "the intensity of malarial influences which prevail there."

Dysentery and diarrhœa were also more fatal in 1892 than for several previous years. The number of deaths recorded was 5,449 or 1·21 per 1,000, as compared with 4,162 or 0·91 in 1891. As with other diseases the mortality was heaviest in the Arakan division.

The year 1892 in the Central Provinces was, generally speaking, more healthy than its predecessor, although there was a slight increase of mortality due to the prevalence of cholera in a few districts. Fewer births were registered, the number being 364,745, representing 38·39 per 1,000 of population, against 379,918 or 39·99 in 1891. The decrease of 15,173 was spread over 15 of the 20 districts. The highest district birth-rate of 45·03 was recorded by Chhindwara, and the lowest of 34·79 by Burhanpur. Out of the total 20 registering districts, the birth-rate was above the provincial average **Central Provinces.**

in 10, below it in 7, and nearly equal in 3. In 17 districts more births were registered than deaths, the excess for the province being in the ratio of 4·25. First among the districts with more deaths than births was Raipur with an excess ratio of 10·80, due to the terrible mortality from cholera, which carried off about 17,000 persons. The total number of deaths registered in the province was 324,348, or 34·14 per 1,000, against 313,364 or 32·98 in 1891. The increase of 10,984 deaths was entirely due to the severe prevalence of cholera and to a slight increase of 247 in small-pox, for there was a decrease of deaths under all other heads. The highest death-rate recorded was 46·66 per 1,000 in Raipur, and the lowest 27·93 in Bilaspur.

Of the chief diseases cholera accounted for 39,972 of the total deaths, yielding a ratio of 4·21 per 1,000 of population, nearly double the mortality of 1891. The disease prevailed more or less throughout the province, but chiefly in the three districts of the Mahanadi division, where the number of deaths exceeded 25,000. One half of the 20 districts suffered more and one half less than in the previous year, the chief of the former being the above three districts, viz., Raipur with a ratio of 13·50 against 1·46 in 1891, Bilaspur 8·25 against 0·96, and Sambalpur 4·84 against 0·03. In nearly all districts the disease is said to have been imported and disseminated by means of pilgrims, a doctrine which the Army Sanitary Commission notice "is so "easy that it meets with ready acceptance, and the facts on which it is based are "frequently not examined as they ought to be." The Officiating Sanitary Commissioner (Deputy-Surgeon W. Center) attaches great importance to the Majh Mela fair at Allahabad as the centre from which the epidemic began, but Dr. Hutcheson in his Report on the North-Western Provinces and Oudh states there was no cholera at that fair, and only three deaths were returned for the whole district in January. "Pilgrims "coming from the fair," the Commission remark, "doubtless were attacked with "cholera in the Central Provinces and elsewhere, not, so far as the evidence goes, "because of the fair, but because they were persons undergoing more than ordinary "privation and fatigue, and, therefore, more subject to attack than they otherwise "would have been." In further discussing this theory of importation the Commission urge the necessity for practical action being directed to places and not to persons. They contend that more desirable results are to be obtained by improvement of localities in which the people live than by measures for relieving the sick. "Whatever "may be said," they say, "in regard to other countries, and on that question there is "no occasion to enter, there cannot be the smallest doubt that in India it must be by "the improvement of localities that any decided results can be hoped for."

Small-pox was slightly more prevalent than in 1891, and the deaths rose from 748, or 0·08 per 1,000 to 995 or 0·10. Three districts out of the 20 were exempt from the disease, and in a fourth (Nimar) but one death was returned. In fact only in the five districts of Bilaspur, Saugor, Raipur, Chanda, and Sambalpur, was the mortality at all severe. These favourable results, the Army Sanitary Commission observe, speak well for the vaccination work of the province.

Fevers accounted for more than a half of the year's mortality. The number of deaths was 188,017 or 2,533 less than in 1891, the provincial death-rate being 19·79 against 20·05. Out of the 20 districts 13 showed a decrease in mortality and seven an increase, as compared with the results of 1891. Nimar headed the list with a ratio of 31·37, followed by Mandla with 25·84, while the minimum of 9·98 was returned by Betul.

The deaths registered from dysentery and diarrhœa amounted to 16,021 or 1·69 per 1,000 against 20,889 or 2·20 in 1891. The decrease of 4,868 was spread over almost all the districts. In a few the rates were rather high, but only in five districts was the provincial ratio exceeded, that of Sambalpur being the highest (6·92).

Assam.

Greater attention appears to have been paid to the registration of vital statistics in Assam during 1892 than in previous years. The number of births registered rose from 143,548 or 28·59 per 1,000 of population in 1891 to 155,909 or 31·05, which is the highest ratio on record. The increase of 12,361 births was contributed to by every district, but the most marked improvement occurred in Kamrup, Lakhimpur, Goalpara, and Sibsagar districts, where the birth-rates increased from 21·32, 21·70, 32·51 and 21·77 respectively, to 28·50, 27·57, 37·06, and 25·72. The number of deaths registered rose from 150,156 or 29·91 per 1,000 in 1891 to 171,784 or 34·21 in the year under review, the increase being attributed partly to improvement in registration and partly to a heavier rainfall throughout the province. Every district recorded a higher rate of mortality than in 1891 except Cachar and Goalpara. The average death-rate of the province exceeded the birth-rate by 3·16 per 1,000.

Of the chief diseases cholera, though slightly less prevalent during 1892 than in 1891, was very fatal. The total deaths from the disease numbered 21,552 or 4·29 per 1,000, against 23,882 or 4·76, and against 2·84 the ratio of the quinquennial period 1886–90. All the districts were affected, their ratios ranging from 1·76 in Goalpara to 7·39 in Kamrup. The latter ratio was nearly double that recorded in the previous year, and showed an increase of 2,112 deaths. Sylhet district also recorded 1,639 more deaths from cholera, Sibsagar 371, Lakhimpur 336, and the Khasi and Jaintia Hills 184. In the remaining four districts the mortality was lower than in 1891. Out of 13,624 villages in the province only 18 per cent. recorded deaths from cholera. "With such a history of wide-spread persistence, and yet at the same time of remarkable isolation, it would be very difficult," the Army Sanitary Commission remark, "to fit in any theory of importation to account for the disease."

The mortality from small-pox was lower in 1892 than in any year since 1879, the deaths numbering only 1,452 or 0·29 per 1,000, against 2,361 or 0·47 in 1891. Kamrup was the only district in which the death-rate was at all high (1·62 per 1,000). Nowgong district, with a population of 344,141, enjoyed a complete immunity from the disease, and only one death occurred in the Khasi and Janitia Hills, and three in Lakhimpur. Of the total small-pox deaths in the province 229 occurred among infants under one year and 869 among children under 12.

The deaths registered under fevers aggregated 93,971, equivalent to a rate of 18·72 per 1,000 of population, exceeding the number recorded in 1891 by 18,006 or 3·59. Of the nine districts Goalpara recorded the highest fever death-rate of 29·79 and Lakhimpur the lowest of 13·38. The deaths recorded under this head included 6,734 as due to kala azar against 9,937 in 1891. This disease was rapidly decreasing in the Kamrup and Goalpara districts, but was steadily advancing in Darrang and Nowgong, so much so in fact than 10 new dispensaries in these two districts were opened or sanctioned during the year with the special object of coping with it. Further inquiry was made concerning kala azar with the result that the cause had yet to be discovered, for the *dochmius duodenalis*, or *anchylostonum duodenale*, which had been claimed as the cause of the disease, was proved to exist in persons just arrived in the province from other and distant parts of India. "The practical outcome of the "whole discussion," the Army Sanitary Commission observe, "would seem to be what "we suggested in our remarks on the Assam Report for 1891, that the best method "of dealing with this question does not consist in attempts directed to prevent the "importation of the parasite, which, even if it were beyond all doubt the cause of "the disease, could never be successful, but in the improvement of the local conditions "under which the people live." Active measures in this direction had already commenced in affected parts.

Under dysentery and diarrhœa 15,685 deaths were registered, being in the ratio of 3·12 per 1,000 against 14,418 or 2·87 in 1891. In the opinion of the Sanitary Commissioner, Dr. Costello, the excess in some districts was due partly to misregistration of diarrhœa for cholera.

Madras.

The results of birth registration in the Madras Presidency during 1892 show a diminution of 79,209 births as compared with the previous year, the number having decreased from 924,238 or 27·4 per 1,000 of population to 845,029 or 25·1. The falling off was ascribed to the distress that prevailed during the year under report and the previous year, and also, in great measure, to defective registration, though the Sanitary Commissioner (Surgeon-Colonel Laing) does not see any reason to suppose that registration retrograded in 1892; "and until it is made compulsory in rural tracts," he says, "the returns cannot be expected to be accurate." In all the 22 districts, except South Canara, Tinnevelly, and Godavari, the birth-rates were lower than in 1891, and in no district was the supposed standard of 40 per 1,000 reached, the highest recorded being 36·8 in Madras. In only three other districts was the rate above 30 per 1,000, while in 17 it was between 20 and 30, and in Ganjam it was 17·8. The special attention of the collectors concerned has again been drawn by the Local Government to the matter of registration. The birth-rate exceeded the death-rate in 15 out of the 22 districts.

The year was generally an unhealthy one, and the number of deaths registered was 750,755 or 22·3 per 1,000 of population, a higher rate than had been recorded since 1878, though, compared with 1891, there was very little difference, the deaths in that year being 747,553 or 22·2 per 1,000. The mortality amongst infants was, as usual, high. Of the total deaths, 146,948 or 19·6 per cent. were children under one year of age, and calculated on the number of children born during the year, the death-rate of

infants equalled 173·9 per 1,000. The death-rate varied considerably in the different districts, Madras recording the highest of 46·5, and the remainder ranging from 35·1 in Kurnool to 14·3 in Ganjam. In 11 districts the death-rates were lower than in 1891, and in 11 they were higher. The greatest decrease occurred in the South Arcot district, the death-rate for 1892 being 18·8 per 1,000 as compared with 29·6 in 1891, and was mainly due to a lower mortality from cholera and small-pox. Madras also showed a marked decrease of nearly 7 per 1,000, owing to fewer deaths having been recorded under cholera, dysentery and diarrhœa, and all other causes. The average death-rate of the 55 municipal towns was 29·4 per 1,000, or 7·5 higher than the district rate, and was made up of ratios ranging from 18·2 in Salem to 55·2 in Kurnool.

Deaths from cholera in the Presidency were fewer than in 1891 by 19,740, the number having declined from 98,773 or 2·9 per 1,000 to 79,033 or 2·3. The mortality in 1892 was, however, larger than that of any other year since 1882. The disease prevailed throughout the year, and visited every district, being most severe in Godavari, Kurnool, and Tanjore, where the death-rates were 6·5, 6·0, and 4·1 per 1,000 respectively. In the first of these districts cholera prevailed for about six months, and the deaths rose from 1,496 in 1891 to 13,618. In Kurnool the deaths from the disease amounted to 4,886, the largest number recorded since 1878. Tanjore registered 9,093 deaths from this cause against 6,565 in 1891, the great majority having occurred in the months of January (4,549) and February (1,946). Out of 44,678 villages in the Presidency, 17½ per cent. were affected by cholera. The highest percentage occurred in Kurnool, where 36 per cent. of the villages were attacked. Only two out of the 55 municipalities, Palni and Ootacamund, were free from cholera. The disease affected the urban more than the rural circles, the death-rate for municipal towns being 3·2 or 0·9 more than that of the districts. In summing up the year's history of cholera in the Presidency, the Sanitary Commissioner says:—"Although many deaths were "registered from cholera in 1892, still the year has been one of subsided activity with "regard to this disease in the Presidency. No new light has been thrown upon the "etiology of the disease, but there is sufficient evidence to show that insanitary "conditions tend to localise cholera, and that the best way of preventing the origin "and spread of cholera is to remove all local insanitary conditions and carry out the "sanitary measures which are known to be antagonistic to the prevalence of the "disease." In these remarks the Army Sanitary Commission entirely agree.

Small-pox caused 43,757 deaths, equal to 1·3 per 1,000 of population, an excess of 2,435 on the mortality of 1891. The increase was chiefly due to the prevalence of the disease in the Malabar and Godavari districts, where 7,320 more deaths were registered in 1892 than in 1891. The death-rate in Malabar from this cause was 4·4 per 1,000, but here, it is stated, vaccination is carried on under many disadvantages: the houses are scattered and not collected together as in other districts forming villages and towns, and the females, who appear to have a preponderating influence in the household, are greatly opposed to vaccination, while the Moplah population, which is very conservative and ignorant, oppose any new practice. Small-pox deaths were registered in 47 of the 55 municipal towns, Cochin heading the list with a ratio of 19·9 per 1,000. Vaccination is not compulsory in this municipality, and the people are opposed to it, many believing that when small-pox is prevalent vaccination will cause an attack of the disease.

The deaths ascribed to fevers were more numerous than in any year since 1879, and numbered 280,627 or 8·3 per 1,000, against 247,029 or 7·3 in 1891. The principal cause of this great increase was malarial fever, due to the heavy rainfall of the year, and also to the rise in the prices of food grains and the consequent distress which prevailed. As in previous years Kurnool suffered more than any other district, recording a fever death-rate of 22·8 per 1,000, followed by Nilgiris, Cuddapah, Vizagapatam, and Madras, with ratios ranging from 17·7 to 15·6. In municipal areas the mortality, as usual, was less than in rural tracts, the Presidency district rate of 8·4 per 1,000 being 1·4 greater than the municipal rate.

The deaths registered as due to dysentery and diarrhœa numbered 32,293 or 1,930 less than in 1891, the death-rate, 1·0 per 1,000, being the same in both years. "There "is no doubt," the Sanitary Commissioner remarks, "that many of the deaths may be "attributed to the people having to resort to unwholesome kinds of food owing to "failure of crops and the high prices of food." Madras district recorded the highest mortality under this head of 8·9 per 1,000, followed by Chingleput with a ratio of 3·2.

Improvement is still needed in the registration of vital statistics in the Bombay Presidency, especially in the Sind districts. During 1892 there were 650,667 births registered, equivalent to 34·57 per 1,000 of population, against 682,677 or 36·27 in 1891. Of the 24 districts in the Presidency, all but five (Nasik, Thana, Kolaba, Ratnagiri, and Kanara) recorded fewer births than in the previous year. Three districts recorded birth-rates of over 40 per 1,000, and 15 of over 30 per 1,000, the ratios of the remaining five districts ranged between 28·22 in Shikarpur and 16·57 in Thar and Parkar. Bombay.

The year 1892 was more unhealthy than its predecessor, and the registered deaths rose from 513,132 or 27·26 per 1,000 to 611,742 or 32·50, an increase of 98,610. The Acting Sanitary Commissioner attributed the unhealthiness of the year to the continuance of influenza in Sind and Gujarat, to scarcity in parts of the southern registration district in the first half of the year, and to the prevalence of cholera. In the districts the death-rates varied between 47·51 per 1,000 in Ahmedabad and 20·93 in Ratnagiri. As usual, the mortality amongst young children was very high in comparison with other periods of life. Among infants under one year the percentage of total deaths was 19·95, and among children above one and under five years the percentage was 20·92, together representing nearly 41 per cent. of the year's mortality.

Under all the chief death causes, except dysentery and diarrhœa, more deaths were registered than in 1891. Cholera prevailed to an unusual extent, and accounted for 42,900 deaths, or 25,050 in excess, the rate of mortality being 2·28 against 0·95. The disease prevailed more or less in all parts of the Presidency throughout the year, but especially in Sind. Among the districts most severely affected were Karachi, Dharwar, and Hyderabad, with cholera death-rates of 9·98, 7·92, and 6·27 respectively. Out of 25,206 villages, cholera was present in 12·20 per cent. The highest percentage occurred in Karachi district, where, out of its 791 villages, 53·60 per cent. were attacked. The great fair held in July at Pandharpur, in Sholapur district, passed off without any outbreak of the disease, the first case having occurred when the fair was practically over. The disease, however, was prevalent only to a very small extent in the district. The Acting Sanitary Commissioner states that, in his experience, cholera occurs at fairs only when it is previously prevalent in the district in which the fair is held.

The number of deaths registered from small-pox, though not very great, was almost double that of the preceding year, but was considerably below the average. The fatal cases amounted to 2,770 or 0·15 per 1,000, against 1,491 or 0·08 in 1891. In the districts the highest death-rate, 0·67 per 1,000, was registered in the town and island of Bombay, followed by 0·46 in Dharwar. Only one district (Upper Sind Frontier) out of the 24 was free of the disease. According to age, 24·99 per cent. of the deaths occurred amongst infants under one year of age, and 46·71 per cent. took place among children between one and 12 years of age. In their remarks on the influence of vaccination on small-pox, the Army Sanitary Commission say there is strong evidence in the Presidency of the excellent work done by the Vaccination Department, "but "the more strikingly it can be exhibited the better, for there could be no more "effective means of overcoming prejudices and demonstrating the real protection from "small-pox which successful vaccination offers."

Deaths from fever increased from 368,913 or 19·60 per 1,000 of population in 1891 to 438,038 or 23·27. This rate was exceeded by 11 districts, the highest being 41·41 in Ahmedabad, followed by Broach, Shikarpur, Kaira, and Surat, with rates of over 30 per 1,000. The most fatal month was January, when 57,782 deaths were reported, and the minimum mortality took place in June, when there were 25,480 deaths.

Dysentery and diarrhœa were the cause of 35,406 deaths, equal to 1·88 per 1,000 of population, against 37,728 or 2·00 in 1891. In nine districts the mortality under this head was less than in the preceding year, and in the remainder it was slightly higher. The highest rate was recorded by Belgaum 5·95, Dharwar following with 4·97, and the lowest by Hyderabad, 0·06.

The number of births registered in Berar during 1892 was considerably below that of the previous year, viz., 113,640 or 39·9 per 1,000, against 121,755 or 42·8. The decrease was spread over all the districts of the province. Akola district recorded the highest birth-rate of 43·7, Buldana following with 43·0; the rates of the remaining four districts varied from 42·3 in Ellichpur to 33·1 in Wun. The year was much more healthy than 1891, and the deaths fell from 115,558 or 40·6 per 1,000 to 82,124 or 28·8. The district death-rates ranged from 33·2 in Ellichpur to 24·0 in Wun. For towns the mortality rate was 29·3 per 1,000 as compared with 28·8 for rural circles. The Berar.

registration of vital statistics in the towns had hitherto been more defective than in rural circles, but in 1892 the reverse seems to have been the case. Improvement, however, is expected from the enforcement of the rules which have been framed concerning the inspection of registers by the officers of the Vaccination Department during their tours.

Cholera was prevalent throughout the whole of the province in 1892, but the area affected was greatly reduced, and the disease was of a milder type than in the previous year, the deaths having fallen from 7,958 or 2·8 per 1,000 to 2,030 or 0·7. Of the total 5,718 villages in the province only 145 reported cholera deaths. "These figures," the Army Sanitary Commission remark, "are very striking, and have a direct "bearing on the causation, and, what is still more important, the prevention of "cholera. At six places, where outbreaks occurred, the disease was reported to have "been due to importation. But even if this had been proved beyond all manner of "doubt, it would afford but little or no practical help in dealing with the question. "It is simply impossible to devise measures which could prevent such importation, but "happily the general history of the disease, as indicated in the figures above cited, "shows very clearly that far too great stress has been laid on this supposed cause of "cholera epidemic, and that other causes have to be taken into account, which "fortunately can be dealt with much more easily and effectively than attempts at "controlling the free and unrestricted movements of the people. These causes are "the local insanitary conditions which so frequently prevail in Indian towns and "villages."

The registered deaths from small-pox were just double the number of 1891. The disease, however, was again very slight, and the low mortality of 68, as compared with 34 in 1891, bears evidence of the efficiency of vaccination. As an instance of the excellent vaccination work done in this province, the Army Sanitary Commission notice that, while in the 12 years 1869 to 1880 the total number of small-pox deaths was 38,840, in the 12 years ending 1892 the number was only 8,828.

From fevers the deaths fell from 49,850 or 17·5 per 1,000 in 1891 to 41,661 or 14·6. The district ratios ranged between 12·0 in Basim and 18·0 in Wun. The high fever rate of Wun was attributed to the district being more malarious than the others on account of the large extent of jungle and uncultivated land. In many parts, the Sanitary Commissioner says, the inhabitants suffer from malarial cachexia to a marked degree, but he believes that, as the country gets more opened up by destruction of jungle and by cultivation, the fever death-rate will be lower.

Dysentery and diarrhœa accounted for 11,200 deaths, representing 3·9 per 1,000 of population, as compared with 22,007 or 7·7 in 1891. In every district there was a decrease in the mortality under this head. Ellichpur as usual recorded the highest district rate of 7·8 per 1,000, and in the other five districts the rates ranged from 5·4 in Akola to 1·1 in Wun.

IV.—JAILS.

Sickness and mortality in 1892.

The health of the jail population of India during 1892 was on the whole unsatisfactory. In the admission and constantly-sick rates there was a great increase as compared with the previous year, the former having risen from 979 to 1,117 per 1,000 of average strength, and the latter from 34 to 38 per 1,000; the death-rate also rose from 30·19 to 35·94. Of the ten provinces, all but Coorg returned a higher jail death-rate than in 1891, the most noticeable cases being the Central Provinces and Bengal. Cholera was present in some jails in all the provinces except Berar and Coorg, and accounted for 510 deaths, equal to a ratio of 5·32 per 1,000 of average strength against 324 or 3·48 in 1891. There were fewer deaths from fevers, but dysentery and diarrhœa showed an increased mortality.

The following statement shows the sickness and mortality among all classes of prisoners in the jails and subsidiary jails of the several provinces for 1892, as compared with the previous year:—

Provinces.	1892.			1891.		
	Ratio per 1,000 of Average Strength.			Ratio per 1,000 of Average Strength.		
	Admissions.	Daily Sick.	Deaths.	Admissions.	Daily Sick.	Deaths.
Bengal - - - -	1,179	40	43·78	1,170	38	30·97
North-Western Provinces and Oudh	931	41	29·14	781	34	27·62
Punjab - - - -	2,199	47	30·54	1,746	40	28·30
Burma - - - -	934	39	33·10	891	34	30·12
Central Provinces - - -	945	31	44·66	792	28	30·37
Assam - - - -	1,913	55	58·97	1,742	68	52·11
Coorg - - - -	1,143	47	30·34	1,458	50	32·64
Madras - - - -	724	25	45·14	637	21	35·33
Bombay - - - -	787	29	36·52	676	25	32·44
Berar - - - -	575	16	17·16	440	13	11·29
India - - - -	1,117	38	35·94	979	34	30·19

Bengal.

Sickness and mortality prevailed to a much greater extent in the Bengal jails during 1892 than in the previous year. The rate of admission into hospital rose from 1,170 to 1,179 per 1,000, the average sick-rate from 38 to 40, and the death-rate from 30·97 to 43·78. The chief causes for the increase were the general unhealthiness of the season, and want outside the jails. Among all classes of prisoners there were 752 deaths, or 259 more than in 1891, and of the total, 195 were due to bowel complaints, 100 to respiratory diseases, 68 to cholera, and 45 to fevers. The number of admissions from dysentery and diarrhœa was nearly 1,000 more than in 1891, and the ratio per 1,000 of average strength rose from 290·5 to 328·2. Of the total deaths, 683 occurred among convicts (including 112 released on medical grounds), representing a ratio of 43·1 per 1,000. It has been directed that all prisoners who are released on the ground that they are likely to die must be shown as deaths in the mortality statistics of the Jail Department. Excluding the moribund cases and three cases of death by accident, the number of prisoners who died in other than subsidiary jails was 551, and of these only 166 were received in good health while 207 were found to be in indifferent health, and 178 in bad health. Of the 46 jails in the province 22 returned a convict death-rate exceeding the provincial rate, and of these one recorded a mortality of over 200 per 1,000, and six of over 100, viz., Naya Dumka 221·1, Dinajpur 156·8, Singhbhum 135·9, Jalpaiguri 126·1, Birbhum 112·5, Bogra 109·0, and Rangpur 109·3. The majority of the deaths in these jails were of convicts who were received in bad or in indifferent health. In 11 other jails the convict mortality exceeded 50 per 1,000. In three of the 46 jails there were no deaths. Some of the more unhealthy jails were partially emptied so as to allow

prisoners admitted in bad health the benefit of a change of climate, the result being a remarkable improvement, "showing how much sickness is due to the bad climate of the districts they come from." It is reported that weak and sickly prisoners were more extensively employed during the year on gardening and other light work of similar nature, and that the great attention now paid by jail superintendents has resulted in a general improvement in the health of this class of prisoners, and has diminished the numbers in the special and convalescent gangs. Much attention appears to have been devoted during the year to the improvement of the water supply of the jails. Several important reforms in the matter of appliances were introduced with a view to prevent contamination in handling or carrying water.

North-Western Provinces and Oudh.

The greater unhealthiness of the year 1892 in the North-Western Provinces and Oudh, as compared with 1891, affected the prisoners, though not so severely as the free population, for the jail death-rate was not excessive. The admissions into hospital per 1,000 of average strength rose from 781 to 931, the daily average sick from 34 to 41 per 1,000, and the death-rate from 27·62 to 29·14. The increased ratios were attributed mainly to the bad or indifferent health of the prisoners on admission into jail. The most fatal diseases were cholera with 42 deaths (1·52 per 1,000), dysentery and diarrhœa 177, and respiratory diseases 144. Cholera, although exceedingly prevalent throughout the provinces, was not so fatal in the jails as in the previous year, when the deaths from the disease numbered 95. Of the total 803 deaths, 737 occurred among convicts, yielding a ratio of 28·68, against 27·78 in 1891. This average death-rate was exceeded in 23 jails, the highest being 87·44 in Gorakhpur jail, which was chiefly due to the bad state of health of convicts entering the jail, and to an outbreak of cholera. Owing to the persistent high mortality in this jail a new one was being built, entirely by prison labour, on a fresh site. Banda jail followed with a mortality rate of 85·75, the bad state of health of prisoners on admission also being the principal cause, as less than 50 per cent. of the 732 admissions during the year were in good health. To the same cause was attributed the Ghazipur jail death-rate of 60·94. Two other jails (Aligarh and Saharanpur) recorded death-rates of over 50 per 1,000, seven of over 40, and 11 of over 30 per 1,000. Much good work was again executed during the year in improving the sanitary condition of the jails, in conformity in many cases with the recommendations of the Jail Committee.

Punjab.

The health of the jail population of the Punjab during 1892 was less satisfactory than in the previous year, but the death-rate compares favourably with that of the free population. There was overcrowding in 21 of the 33 jails, though in some it was trifling, the chief reason being the widespread prevalence of cholera, which prevented the transfer of prisoners. Admissions to hospital were in the ratio of 2,199 per 1,000 of average strength, against 1,746 in 1891, the daily average sick-rate rose from 40 to 47 per 1,000, and the death-rate from 28·30 to 30·54. "In comparing the figures of the two years," the Inspector-General of Jails states, "it is worthy of "notice that during one of the unhealthiest years on record, while the death-rate "of the free population took a bound from 29·13 to 49·48, an increase of 20·35 per "1,000, that of the prisoners rose only by 2·24 per 1,000 of average strength. It is "therefore matter for congratulation that the jail population has suffered only to a "comparatively slight extent, and it is also one reflecting no small credit on the "officers to whom its welfare is entrusted. Much has been and is being done to "improve the sanitary condition of our jails, but there is no influence affecting "mortality among the prisoners stronger than the personal one exercised by a "superintendent." In one jail (Dharmsala) there were no deaths, in six the mortality was less than 15 per 1,000, and in 15 others the provincial rate was exceeded, the ratios ranging from 75·56 in Karnal to 31·77 in Delhi. Among the convict class the death-rate was 30·73 per 1,000, as compared with 27·94 in the preceding year. From all the principal diseases there were more deaths than in 1891. Dysentery and diarrhœa accounted for 69, an increase of 18; respiratory diseases 155, or 34 more, of which 140 resulted from pneumonia, 70 having occurred in the first quarter of the year and 52 in the last. The excessive mortality of the first quarter was to some extent due to the prevalence of epidemic influenza in parts of the province, and the large number in the last quarter was in great measure the result of the deterioration of health consequent on the severe epidemic of autumnal fever. From cholera, which existed in an epidemic form throughout the province for a great part of the year, there were 29 deaths, an increase of 17 on the number recorded in 1891. Of

these, 12 occurred in the Lahore, and 10 in the Mooltan Central jails. In both instances the prisoners were moved into camp; they returned to jail in September, and remained free from further attack. Of the jails showing an improvement in the health of the convicts, the most noteworthy is that of Umballa, the death-rate of which fell from 48·85 to 14·19, and was ascribed by the superintendent to the remedying of defects in the water-supply, and to boiling the drinking water. The reduction in the death-rate of the Dharmsala jail from 9·90 to *nil*, of the Chenawan Central jail from 30·37 to 8·22, of the Sialkot jail from 41·92 to 21·32, and of the Gujranwala jail from 51·28 to 12·11, were also greatly due to the care bestowed by the superintendents on matters affecting the health of the prisoners.

Burma.

In Burma the health of the prisoners was not satisfactory, the rates of admissions into hospital, daily average sick, and deaths being 934, 39, and 33·10 per 1,000 respectively, as compared with 891, 34, and 30·12 in 1891. The increase was entirely due to cholera, the deaths from which rose from 52 to 107. The disease appeared in 12 of the 31 jails, and in eight of them it was more or less epidemic; while in each of the jails at Akyab and Myingyan there were two distinct epidemics, resulting in 16 deaths at the former and 25 at the latter. Cholera was also severely felt at the jails of Toungoo, Magwe, and Moulmein, which respectively contributed 24, 12, and 11 fatal cases. The removal of prisoners into camp was attended with satisfactory results. Exclusive of cholera the provincial jail death-rate was only 24 per 1,000, against 25·58 in 1891. From the other chief diseases, viz., respiratory diseases, fevers, and dysentery and diarrhœa, the mortality was less than in the previous year, especially the last-named, from which the deaths decreased by 15, the number being 71 against 86. In 13 jails not a single death was recorded under dysentery and diarrhœa. Of the total 392 deaths all but 17 occurred among the convict class, representing a ratio of 32·92 per 1,000, against 30·10 in 1891. In four of the 31 jails there were no deaths, and in 13 the provincial average was exceeded, in some of the smaller jails very considerably. Of the seven central prisons the highest death-rates were returned by Moulmein (50·97) and Myingyan (53·43). It appears that the sanitary condition of the Moulmein jail has been made the subject of special correspondence, and it may have to be converted into a district jail if the health of the prisoners does not improve. The accommodation for prisoners was considerably increased during the year by the occupation of three new jails and the expansion of certain district jails. Before the new jails were opened in July there was much overcrowding but from that date it practically ceased. In several cases the overcrowding was due to cholera which forbade transfers to other jails.

Assam.

The health of the jail population of Assam during 1892 was again very unsatisfactory. The admissions into hospital among all classes of prisoners were in the ratio of 1,913 per 1,000 of average strength against 1,742 in 1890, the daily sick rate was 55 per 1,000 against 68, and the death-rate 58·97 against 52·11. The number of deaths was really less than in 1891, being 76 against 84; the average strength, however, of the jails was smaller, which accounts for the higher death-rate of the year under notice. The increased mortality was chiefly due to the large number of deaths in the Gauhati, Nowgong, and Dibrugarh jails. The Chief Commissioner during his tour inspected these three jails, and made full inquiry into the cause of the heavy mortality; he was satisfied that it had nothing to do with any defects in the sanitary condition of the jails. The causes assigned by him were the large number of anæmic coolies (punished for desertion) admitted into the Dibrugarh jail, the prevalence of *kala-azar* in the town and district of Nowgong, and the stoppage of the water-supply at Gauhati. Special instructions were given by the Chief Commissioner regarding the Gauhati jail, which if attended to, he believed, would result in a considerable decrease in the death-rate in future years. Of the total 76 deaths, the three jails above-mentioned contributed 42, viz., Gauhati 25, equal to 130·36 per 1,000 of average strength, Nowgong 8 or 119·58, and Dibrugarh 9 or 144·0. It is satisfactory to notice that in Sylhet jail, which is the largest of the province, there were only 10 deaths against 28 in the previous year. But then there were no special causes at work as in 1891. The deaths in this jail, however, give the high ratio of over 69 per 1,000. Cholera accounted for 12 of the total deaths, against 13 in 1891, and of these Gauhati jail recorded 11; from dysentery and diarrhœa there were 26 deaths, against 38, and from respiratory diseases 12, against seven. All the 76 deaths but three occurred among convicts, yielding a ratio of 61·46 as compared with 54·29 in 1891.

Central Provinces.

The health statistics of the jails in the Central Provinces for 1892 show a large increase of sickness among the prisoners as compared with the results of the previous year, and also a much higher mortality. The ratio of admissions into hospital rose from 792 to 945 per 1,000 of average strength, the daily average sick rate from 28 to 31, and the death-rate from 30·37 to 44·66. The general unhealthiness of the year and the condition in which the prisoners were consequently received into jail, in the opinion of the officiating Inspector of Jails, were the main reasons for these unsatisfactory results. The total number of deaths rose from 142 to 212, and of these 112 occurred among convicts alone in the three gaols of the Chhattisgarh division, viz., 53 in the Sambalpur jail, 26 in Bilaspur, and 33 in Raipur. All three suffered from an outbreak of cholera, especially Sambalpur. The disease was exceedingly virulent in the division, and it was thought probable that the prisoners admitted into these jails brought it with them. The highest jail death-rate was recorded by Sambalpur, its ratio of 309·4 per 1,000 which was more than five times higher than 1891 (58·4), Bilaspur came next with 222·7 against 53·3, Damoh followed with 75·6 against 146·6, and Saugor with 64·9 against 55·8. In the remaining jails the death-rates ranged from 49·3 per 1,000 in Mandla to 9·0 in Chanda. The Sambalpur and Bilaspur jails are reported to be ill-constructed and confined, and plans for their enlargement and improvement were under the consideration of the Public Works Department. All the 212 deaths but eight occurred among the convict class, the rate per 1,000 of average strength being 45·5 against 30·7 in 1891. During the year experiments were made in one or two jails to test the effect of moderate labour upon the health of weakly prisoners, when it was found that the prisoners as a rule gained in weight.

Madras.

The health of the jails in the Madras Presidency during 1892 was most unsatisfactory, and the death-rate was the highest recorded for 10 years. The ratio of admissions to hospital rose from 637 per 1,000 of average strength in 1891 to 724, the average daily sick rate from 21 to 25 per 1,000, and the death-rate from 35·33 to 45·14. This heavy mortality was largely due to the prevalence of cholera from which there were 192 deaths, equal to 39 per cent. of the total. Deducting these the general death-rate is reduced to 27·94. But the presence of cholera in the jails is not to be wondered at seeing that the disease was very fatal throughout the Presidency in 1891 and 1892. "It will be remembered, moreover," the Inspector General of Jails writes, "that from the commencement of the year under report, and indeed from an earlier "date, distress was experienced throughout a great part of the Presidency, and relief "works and famine kitchens were open from 1st January until the middle of "September. The existence of scarcity and the high prices of grain filled the jails "with prisoners who had undergone a more or less prolonged period of privation "outside, and whose health on admission was bad or indifferent." And he draws attention to the fact that out of 476 deaths in district and central jails among convicts 46·7 per cent. occurred among those who had been less than six months in jail. From dysentery and diarrhœa also there was a much higher mortality in the Madras jails than in 1891, the deaths having increased from 90 to 141, equal to 28 per cent. of the total deaths. It will be seen therefore that cholera and dysentery and diarrhœa accounted for nearly three-fourths of the year's mortality. The death-rates of the several jails ranged from 3·75 in Cuddalore to 123·57 in Berhampore. The high mortality of Berhampore was closely followed by Coimbatore with 118·40; Rajahmundry came next with a rate of 99·12, Cannanore with 84·46, and the jails of Vizagapatam, Cuddapah, Salem, and Trichinopoly, with rates of 65·01, 59·63, 50·76, and 50·30 respectively; next came Mangalore with a mortality rate of 40·05 and the Penitentiary with 38·44, the remaining rates were under 30 per 1,000. In 14 jails out of the 26 the mortality was in excess of that of the previous year, the most noticeable cases being those of Berhampore where the rate rose from 20·43 to 123·57, and of Coimbatore from 33·24 to 118·40.

Bombay.

Among the prison population of the Bombay Presidency the amount of sickness and mortality in 1892 was considerably greater than in the previous year. The admissions to hospital per 1,000 of average strength rose from 676 to 787, the daily sick rate from 25 to 29, and the death-rate from 32·44 to 36·52. The increase in the number of deaths from 253 to 293 was largely due to an epidemic of pneumonia at Shikarpur, where 39 of its total mortality of 67 resulted from this disease. All but nine of these 39 deaths occurred in the cold month of January, and in one day alone five prisoners were carried off by the disease. The death-rate of this jail during the year under notice was 121·6 against 57·4 in 1891. It appears that owing to the poor

condition and physique of many of the prisoners in this jail in the previous year, a number of whom showed signs of scurvy, extra precautions for the maintenance of their health were taken in the matter of warmth and extra clothing; but with the advent of 1892 the jail hospital commenced to rapidly fill up, and before the first month was over nearly 6 per cent. of the entire jail population had succumbed to pneumonia. For some years previous the Shikarpur jail had borne an evil name by reason of its high rate of mortality, its average for 15 years reaching 67·5 per 1,000. The Inspector-General suggested abandoning the building and establishing a district jail at Sukkur. Proposals on the subject are under the consideration of the Bombay Government in connexion with the general question of the proposed removal of the head-quarters of the district to Sukkur which was engaging their attention. In the remaining jails the death-rate was highest at Kaira (70·4 per 1,000), mainly due to the generally unhealthy condition of that part of Gujarat consequent on an excessively heavy rainfall. Other jails with death-rates exceeding the provincial rate were Nara 64·1, Karachi 52·3, Hyderabad 46·6, Nasik 45·5, Thana 41·3, and Surat 38·7. Of the total 293 deaths 264 occurred among the convict class, representing a ratio of 36·5 per 1,000 of average strength against 33·7 in 1891.

Berar.

The general health of the prisoners in all the jails of Berar during 1892 was satisfactory. There was complete immunity from cholera, though the disease prevailed in most of the stations in which the jails are situated. The ratio of admissions to hospital was 575 per 1,000 of average strength against 440 in 1891, the daily sick rate 16 or 3 per 1,000 more, and the death-rate 17·16 against 11·29. The total number of deaths was 21; of these 16 occurred in the Akola jail, four having resulted from wounds received by convicts in the quelling of an outbreak among life prisoners. This incident and other matters have, it is stated, led to a fresh consideration of the question of establishing one central jail for the whole province at Amraoti, and the Resident was awaiting the submission of a detailed scheme.

V.—VACCINATION.

General results.

During 1892–93 there were 6,396,480 persons successfully vaccinated in the several provinces of India, being an increase of 513,797 on the number of the previous year. According to age, 2½ millions of the total were children under one year of age, and about 3 millions were children between the ages of one and six years. The proportion of population protected against small-pox by the year's operations ranged from 63·80 in Coorg to 20·34 in the North-Western Provinces, and 23·32 in Burma. In the vaccination of infants the best results were, as usual, obtained in Berar, where 66·4 per cent. of the children born during the year (estimated at 40 per 1,000 of population) were protected. Bombay Presidency came next with a percentage of 56·0, followed by the Central Provinces with 53·5, and the Punjab with 50·5. Of the remaining provinces, only in the North-Western Provinces and Oudh did the successful cases among infants equal 20 per cent. of the estimated births.

Statement showing the total number of persons successfully vaccinated during the year 1892–93:—

Province.	Population among whom Vaccination was carried on (Census of 1891).	Number of Persons successfully vaccinated.	Ratio of successful Vaccinations per 1,000 of Population.	Number of Children successfully vaccinated.		Percentage of Children born during the Year (calculated at 40 per 1,000 of Population) successfully vaccinated.
				Under One Year of Age.	Between One and Six Years of Age.	
Bengal - - -	70,253,264	1,812,257	24·52	319,716	1,289,712	11·4
North-Western Provinces and Oudh.	47,146,327	959,128	20·34	424,016	452,993	22·5
Punjab - - -	20,553,982	684,925	33·25	415,576	116,923	50·5
Central Provinces - -	12,141,731	432,431	34·25	259,632	114,549	53·5
Berar - - -	2,897,040	107,251	37·0	76,986	18,041	66·4
Burma - - -	8,114,513	189,293	23·32	45,505	88,535	14·0
Assam - - -	5,634,258	199,739	31·51	41,920	114,813	18·6
Madras Presidency - -	35,830,282	1,094,707	28·7	259,459	569,220	18·1
Bombay Presidency - -	29,374,621	905,312	30·71	658,004	199,533	56·0
Coorg - - -	173,055	11,437	63·80	1,026	4,545	14·8
Total - - -	232,119,073	6,396,480	27·55	2,501,840	2,968,864	26·9

Bengal.

A radical change was effected during 1892–3 in the administration of vaccination in Bengal. Civil Surgeons are now held responsible for the protection of their districts, and they use their own discretion as to the number of vaccinators it is necessary to employ. Under this new scheme the total number of inspecting officers was increased from 159 in 1891–92 to 259, and of vaccinators from 2,738 to 3,045. Amongst them they performed 1,836,411 operations, of which 1,812,257 were successful, against corresponding figures in 1891–92 of 1,641,088 and 1,614,501. The primary operations numbered 1,820,799, of which 99·32 were successful. According to age, 319,716 of the successful primary vaccinations were of children under one year of age, and 1,289,712 were between one and six years. For the whole province the successful vaccinations were in the proportion of 24·52 per 1,000 of the population. Vaccination is now practised throughout the province, it is compulsory in municipalities, but optional in rural areas, except in certain portions of Rangpur, Bhagalpur, the Sonthal Parganas, and Tippera. The Sanitary Commissioner has recommended its introduction into these areas in accordance with the Act of 1880, but the Lieutenant-Governor hesitates to force upon the people a measure the importance of which they do not recognise, and to which in many districts ancient prejudice renders them hostile. The attitude of the people towards vaccination is described as one of passive acceptance, "but in nearly every district there are sections of the community who openly or "covertly refuse to submit to it, objecting not so much to vaccination in itself as to "the use of human vaccinifers, who are usually of low caste, and to the payment "of vaccination fees." Lymph was obtained during the year from the Calcutta and Darjeeling depôts; the former has been in existence since 1882, but the latter, although established in 1891, was not in effective working till the end of the following year.

The system of preserving lymph by an admixture of lanoline was successfully continued throughout the year, and it can now be prepared so as to remain active for long periods and under various changes of temperature. One of the main objects of the establishment of these depôts has thus been successfully achieved, but without the establishment of several more depôts, at an enormous expenditure, it is impossible to attain the further object of supplying sufficient quantities of animal lymph to enable arm-to-arm vaccination to be entirely abandoned. The introduction of a scheme practised in the Punjab and Central Provinces has, however, been sanctioned as a tentative measure in 12 districts, by which a calf is first inoculated with lanoline lymph, and from this calf all the children of the village, as well as the calves from neighbouring villages, are vaccinated. After operation these calves are returned to their own villages, and when the lymph is ripe vaccination is carried on from them. The operation causes the animals little pain and no permanent injury, and as buffalo calves serve as well as cow calves it is easy to avoid wounding any susceptibilities.

North-Western Provinces and Oudh.

Satisfactory progress was made in vaccination work in the North-Western Provinces and Oudh during 1892–93. The total number of persons vaccinated rose from 1,059,981 to 1,112,117, and the successfully vaccinated from 900,731 to 959,128. The proportion of persons protected by vaccination is, however, still very small, the ratio for the year being only 20·34 per 1,000, which is the smallest ratio attained in any province in India. Primary vaccinations numbered 1,087,755 of which 92·43 per cent. were successful, showing a slight increase on 91·66, the percentage of success in the previous year. Of the 945,364 successful primary cases, 424,016 were infants and 452,993 were children over one and under six years of age, both figures showing a satisfactory improvement as compared with the numbers of the previous year, which were 378,512 and 432,777 respectively. The proportion of persons successfully vaccinated varied very considerably in the different districts. Excluding the hill districts, the ratios per 1,000 of population ranged from 9·96 in Gonda to 30·46 in Muttra. As usual the lowest were recorded in Oudh, but it is satisfactory to learn that the returns of the year show a considerable advance in vaccination in that province, the ratios of five districts being above the average of the United Provinces. Vaccination is carried on in the provinces mostly by animal lymph. In the first circle, however, consisting of 13 districts out of a total of 49, there are no animal lymph depôts. There being little prejudice against vaccination in this circle, arm-to-arm vaccination is adopted with satisfactory results. In the second and third circles calf lymph is used to a certain extent, but the Sanitary Commissioner considers the arm-to-arm system the safest and most effective in India. "There is reason to believe," he says, "that the extension of the use of preserved lymph, as opposed "to fresh lymph derived in the arm-to-arm system, would lessen the amount of "protection against small-pox which is at present afforded by vaccination."

Punjab.

Vaccination work in the Punjab during 1892–93 continued to be on the whole satisfactorily performed. The previous year's results showed a decrease of 37,442 operations which was due to an order forbidding the practice of unnecessary and repeated re-vaccinations. Notwithstanding, in the year under notice, the re-vaccinations rose to 254,958, an increase of 62,862 on the number of 1891–92. On the other hand the primary cases declined from 620,604 to 571,523, which is stated to have been due chiefly to the unhealthiness of the year, and partly to the failure of the lymph supply and the carelessness of some of the vaccinators. Altogether there were 826,481 operations performed, showing an increase of 13,781 cases as compared with the results of the previous year. Of the primary cases, 545,477 or 95·44 per cent. were successful, and of these 415,576 were children under one year of age, representing 50·5 per cent. of the births calculated at 40 per 1,000 of the population. The results of inspection testified to this rate of success, for out of 13,980 cases of children inspected by the Sanitary Commissioner, 95 per cent. were found to be efficiently vaccinated. The provincial ratio of persons successfully vaccinated per 1,000 of the total population was 33·25, a ratio almost identical with that of 1891–92. Progress continued to be made in vaccination work with animal lymph. During the year 93 per cent. of the total vaccinations were performed with this kind of lymph, against 86 per cent. in 1891–92. In 24 out of the 31 districts vaccination work was almost entirely carried on with buffalo lymph; in the remaining seven districts the prejudices against the use of it have not yet been entirely overcome. It is stated that even in the strongly conservative Hindu Hill States some of the rajas and ranas have themselves been vaccinated with animal lymph, and their example has been followed by Rajputs and Brahmans.

Burma.

The total number of vaccinations performed in Lower Burma during 1892–93 was 156,946, being 26,508 more than in the previous year. The increase was widely distributed, for only in five out of the 18 districts were the operations fewer than in 1891–92. With an increase in the amount of work there has also been an improvement in the quality, though the average percentage of success was still much lower than in other provinces. Of the 117,988 primary cases, 86·65 per cent. were successful, against a corresponding ratio of 85·15 in 1891–92. The protection of children still remains very backward, and is a matter, the Government of India point out, for regret, especially in the case of Pegu, where there has been a considerable falling-off in vaccinations for the past two years, and where small-pox is said to be practically endemic. Out of the total 102,199 successful primary vaccinations only 26,521 were of infants, representing 14·2 per 1,000 of the births estimated at 40 per 1,000 of population. In four districts the proportion of successful vaccinations of children under one year old was less than 10 per cent. of the number of infants living. The Vaccination Act was extended in the course of the year to the Pegu Municipality in Lower Burma, and to the Pakokku, Taungdwingyi, and Monywa Municipalities in Upper Burma. At the close of the year the Act was in force in all the large municipalities of the province, and in most of the smaller ones.

In Upper Burma 80,155 persons were vaccinated during 1892–93, being an increase of 18,701 on the number of the previous year. All districts contributed to the increase except four. The percentage of success in primary cases was 86·08, against 85·35 in 1891–92. Out of the 65,633 successful primary cases, 18,984 were infants and 34,581 were children from one to six years of age. Estimating the births at 40 per 1,000 of population only 13·7 per cent. were successfully vaccinated in 1892-93. In the province of Burma as a whole the ratio of successful vaccinations per 1,000 of population was only 23·32, being the lowest of all the provinces except the North-Western Provinces and Oudh. The attitude of the people towards vaccination, the Sanitary Commissioner says, is generally antagonistic, and the work of the vaccination staff is too frequently a hopeless struggle against ignorance and prejudice. In some places work is greatly interfered with through the popularity of inoculators. It was suggested that the practice of inoculation should be punished criminally; but the Chief Commissioner considered it more expedient to destroy the alleged popularity of the inoculators in rural areas by steadily pushing vaccination, and satisfying the people of its efficacy, than to treat them as offenders against the criminal law, and he recommended that the plan of instructing inoculators in the method of vaccination and employing them as vaccinators should be persevered in.

Assam.

Progress continued to be made in vaccination work in Assam during 1892-93. The total number of operations performed was 224,943 against 206,331 in 1891–92, showing an increase of 18,612, which was contributed to by eight out of the total 13 districts. The increase was chiefly noticeable in Kamrup, where 25,273 people were vaccinated as compared with 11,916 in the previous year, and in Sylhet, which showed an increase of 7,897. In both cases the improvement was due to the energy shown by the Civil Surgeons and the civil authorities concerned. There was also a satisfactory increase in the tea gardens. On the other hand the Naga Hills showed the large decrease of 7,165, which is explained in some measure by the fact that the figures for 1891-92 were altogether exceptional owing to a very extensive outbreak of small-pox which caused the people to flock to the dispensaries and vaccination centres for protection against the disease. The primary vaccinations numbered 214,096, and of these 199,072, or 93 per cent., were successful. Exclusive of tea gardens, full returns of which are not given, but including dispensary work, 41,920 of the 190,694 successful primary cases were children under one year old, and 114,813 were between the ages of one and six years. The Compulsory Vaccination Act has been extended to nine municipalities, but it does not appear to be enforced with much strictness, as in some places a very small proportion of the population was vaccinated. In the province as a whole, however, the proportion of people protected by vaccination was greater than in any year since 1877, the ratio being 31·51 against 29·93 in 1891. The vaccine depôt at Shillong is reported to have worked well, and the experience gained during the year has confirmed the superiority of glycerine over lanoline paste.

Central Provinces.

The year's vaccination work in the Central Provinces shows a decrease of 9,400 in the number of operations as compared with the results of 1891–92, the total having declined from 463,246 to 453,846. The decrease to some extent was due to the introduction of the new system of animal vaccination, though opposition to it in some

districts is reported to be rapidly disappearing as experience is gained of the convenience attending it. The decrease was distributed over 10 out of the 18 districts of the province, and was most marked in Sambalpur, which showed a diminution of 2,234 operations. Of the 453,846 people vaccinated 410,891 were primary cases, and of these 96·68 per cent. were successful. In the vaccination of children the results show a steady increase from year to year. In the year under notice 259,632 infants were protected, being in the ratio of 53·5 per cent. of children born, estimating the births at 40 per 1,000 of population. Of children between one and six years old 114,549 were vaccinated. The proportion of persons protected by vaccination in the province was 34·25 per 1,000 of population against 35·55 in 1891–92. The Vaccination Act was extended during 1892–93 to the municipalities of Nagpur, Narsinghpur, Harda, Sambalpur, Damoh, and Hatta, and other towns were following their example.

Madras.

In the Madras Presidency there was an increase of 111,121 in the total vaccinations as compared with the operations of the previous year, the number having increased from 1,053,420 in 1891–92 to 1,164,541 in 1892–93, the increase being largely due to the introduction of animal vaccination. There is still, however, much room for improvement, as shown by the facts that only 29 per 1,000 of the population are protected from small-pox, and that small-pox was more prevalent in the year under notice than in any of the preceding seven years. The number of persons primarily vaccinated was 1,106,517, and of these 95·2 per cent. were successful cases. A considerable advance was made in infantile vaccination, the number successfully vaccinated under one year of age (259,459) exceeding the figure of the previous year by 48,807. Excellent results were achieved in the districts of Coimbatore, Madura, North Arcot, South Arcot, South Canara, Tinnevelly, Trichinopoly, and Vizagapatam, where the increase in successful primary cases ranged from 17,313 to 6,270. At the close of the year vaccination was compulsory in all the municipal towns except Bimlipatam, Cochin, Karur, and Tanjore. Vaccination from animal lymph was conducted in all districts and in all municipalities except Srirangam, and the number of operations performed with it reached 884,525 against 674,148 in 1891–92, the percentage of success being 96 against 94. It is reported that the best results were obtained with fresh animal lymph, next with glycerine paste, and lastly with preserved animal lymph, the percentages of success being 97·3, 96·4, and 95·1 respectively. The reorganisation of the department was under the consideration of the Government at the close of the year.

Bombay.

The number of people vaccinated in the Bombay Presidency during 1892–93 showed a decline of 11,307, the total being 986,758 against 998,065 in the previous year. The decrease was most marked in primary vaccinations, the number of which fell from 935,099 to 924,165, a diminution of 10,934. The percentage of success in primary vaccination was 94·99 against 94·56 in 1891–92. The falling off is attributed to the prevalence of fever and cholera, and to scarcity. The number of infants successfully vaccinated was 658,004, and of children between one and six years 199,533. Reckoning the births at 40 per 1,000 of population 56 per cent. of the children born during the year were protected from small-pox. The substitution of animal for human lymph in vaccination continued to increase in the larger towns of the Presidency. Animal lymph was also used in a number of villages in the Poona and Ahmednagar districts. "There is no doubt," the Sanitary Commissioner states, "that keeping up fresh lymph "by arm to arm vaccination is becoming difficult, especially in large towns, owing to "the refusal of parents to allow the lymph to be extracted from the ripe vesicles; "there is not nearly so much objection to the operation for inserting the fresh "lymph." During the year a compulsory Vaccination Act was passed, but the question as to what areas to apply it was still under consideration. The recorded results of the work of the supervising staff show a falling off compared with those of the previous year, the percentage of persons operated upon who were inspected being 34·19 against 38·63 in 1891–92.

Berar.

The results of vaccination work in Berar during 1892–93 show an increase of 17,026 operations, the total number for the year being 145,882 against 128,856 in 1891–92. The excess, however, was mostly under re-vaccinations, which showed an increase of 13,655. Primary cases numbered 101,774, and of these 94·7 per cent. were successful, which is a trifle lower than the ratio of 95·1 in the previous year. Of the ages of those successfully vaccinated 76,986 were infants under one year of age and 18,041 were children between one and six years. The rate of infantile protection, estimating

the births of the year at 40 per 1,000 of population was 66·4, the highest of all the provinces. As regards the efficacy of vaccination the Sanitary Commissioner furnishes statistics showing that for successive quinquennial periods for the last 25 years the death-rate from small-pox has varied inversely as the ratio of successful vaccinations. For the first quinquennium the death-rate was 2·02 per 1,000 of population and the ratio of successful vaccinations was 8·92. For the last period the death-rate had fallen to 0·2 per 1,000, and the ratio of successful vaccination had risen to 35·8. There is little or no opposition to primary vaccination in any part of the province. What little there is, it is stated, is mostly in the municipal towns among the Marwaris and Muhammadans. The Compulsory Vaccination Act was made applicable to all the municipal towns in October of the year under notice, and rules framed under the Act had been circulated to the municipalities concerned for information and opinion.

VI.—MEDICAL INSTITUTIONS.

Civil Hospitals and Dispensaries.

The following comparative statement shows the number of hospitals and dispensaries open in the several provinces of India during 1892 and the previous year, and the number of patients under treatment :—

Provinces, &c.		Number of Institutions.	Number of In-door Patients.	Number of Out-door Patients.	Total Number of Patients.
Bengal	1892	299	37,845	1,575,926	1,613,771
	1891	272	35,859	1,460,195	1,496,054
Calcutta and Howrah	1892	11	25,211	226,772	251,983
	1891	11	25,318	219,818	245,136
North-Western Provinces and Oudh	1892	315	56,226	3,376,125	3,432,351
	1891	299	54,372	3,012,662	3,067,034
Punjab	1892	232	53,425	2,937,314	2,990,739
	1891	228	49,700	2,541,753	2,591,453
Burma	1892	82	29,716	427,813	457,529
	1891	80	28,603	392,190	420,793
Central Provinces	1892	110	8,523	963,904	972,427
	1891	111	8,222	904,654	912,876
Assam	1892	81	5,734	364,098	369,832
	1891	74	4,455	322,391	326,846
Coorg	1892	5	1,292	25,752	27,044
	1891	4	858	22,327	23,185
Madras	1892	449	52,926	3,142,732	3,195,658
	1891	432	51,441	2,775,838	2,827,279
Bombay	1892	269	46,791	1,946,908	1,993,699
	1891	254	43,936	1,798,294	1,842,230
Berar	1892	44	3,858	292,233	296,091
	1891	44	3,537	279,214	282,751
Total	1892	1,897	321,547	15,279,577	15,601,124
	1891	1,809	306,301	13,729,336	14,035,637

Bengal.

The returns of the charitable dispensaries in Bengal for 1892 show a further increase both in the number of institutions and in the number of patients under treatment in them. The total number of dispensaries at work during 1892 in Bengal, exclusive of Calcutta, was 299, an increase of 27 on the number of the previous year. At these there were 1,613,771 patients under treatment, 37,845 being in-door and 1,575,926 out-door patients, against 35,859 and 1,460,195 respectively in the previous year. This shows a total increase of 117,717, which was attributed partly to the opening of new dispensaries and partly to the increasing popularity of the institutions. Besides the 299 dispensaries 11 more had been established, but were not at work during the year under notice. But even this number is far too small to meet the requirements of the large population of the province. Considering, however, that each institution can only serve the people living within easy reach of it, it is satisfactory, the Inspector-General writes, that so large a number as $2\frac{1}{4}$ per cent. of the population obtained gratuitous medical aid in 1892. There was a satisfactory increase in the number both of women and children, but the number of males was nearly four times that of females. "Nothing more "definitely points," the Inspector-General remarks, "to the necessity for the entire "separation of the male and female departments of dispensaries than these figures do, "and the extension of the Lady Dufferin scheme will affect this." The year 1892 was exceptionally unhealthy, and this was indicated by an increase of patients from

nearly all the chief diseases, especially from cholera and dysentery. Cases of venereal diseases rose from 39,053 in 1891 to 42,734. Among the in-door patients there were 5,107 deaths, being in the ratio of 134·9 per 1,000 of total treated, against a death-rate of 133·1 per 1,000 in 1891. The high death-rate is said to be due to the unavoidable admission of a large number of patients in a hopelessly advanced stage of disease. Great attention is paid in these institutions to surgery, and during the year 9,263 major operations were performed against 8,365 in 1891; of these 173 terminated fatally. Operations for cataract also increased from 2,284 to 2,333, and of these more than 81 per cent. proved successful. Medical officers and their subordinates were taking a greater interest in this important branch of their profession. Much, however, remains to be done as the figures are yet very small when compared with the returns of the other great provinces of Upper India, and the Inspector-General hoped that Civil Surgeons and subordinate medical officers would exhibit still greater interest in the matter.

The following statement shows the number of in-door and out-door patients treated in the several hospitals and dispensaries in Calcutta during 1892 and the previous year:—

Name of Institutions.	1892.				1891.			
	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.	In-door Patients.	Out-door Patients.	Total Number of Patients.	Died per 1,000 of In-door Patients treated.
Medical College Hospital	7,054	54,660	61,714	114·1	6,803	56,227	63,030	109·7
Presidency General Hospital	3,498	—	3,498	34·3	2,928	—	2,928	43·3
Campbell Hospital	8,551	11,470	20,021	197·2	9,088	—	9,088	188·2
Police Hospital	2,045	—	2,045	9·7	2,468	—	2,468	9·7
Mayo Native Hospital	1,756	27,508	29,264	129·7	1,884	28,700	30,584	156·5
Chandney Hospital	421	44,947	45,368	23·7	391	42,998	43,389	25·5
Park Street Dispensary	—	28,847	28,847	—	—	29,901	29,901	—
Chitpore Dispensary	—	20,621	20,621	—	—	22,262	22,262	—
Sukea's Street Dispensary	—	18,485	18,485	—	—	18,589	18,589	—
Bhawanipur Dispensary	—	9,737	9,737	—	—	10,884	10,884	—
Total Calcutta Hospitals and Dispensaries	23,325	216,275	239,600	123·2	23,562	209,561	233,123	121·5
Howrah General Hospital	1,886	10,497	12,383	176·0	1,756	10,257	12,013	211·2
Grand Total	25,211	226,772	251,983	127·2	25,318	219,818	245,136	127·8

It will be seen that there was an increase of 6,954 in out-door patients and a slight falling off of 107 in in-door patients. The death-rate among the in-patients was 127·2 per 1,000, being practically the same as in 1891. Cholera patients declined from 761 to 709, and the fatal cases from 455 to 425. Small-pox cases rose from 21 to 35, most of which were treated in the Campbell Hospital. Dysentery and diarrhœa were also less prevalent than in the previous year, and the number of cases of malarial fever among the house patients was 3,799 against 4,235. The total number of in and out patients treated for venereal affections rose from 11,886 in 1891 to 13,072. There were 3,403 important surgical operations performed against 2,221 in 1891, and of these 134 terminated fatally being in the ratio of 37·8 per 1,000, against a ratio of 45 in 1891.

Punjab. Six new dispensaries were opened in the Punjab during 1892, and two dispensaries were closed, leaving the total number of charitable institutions at work in that year at 232. At these, 2,990,739 patients were under treatment, being an increase of 399,286 on the number of 1891. The increased attendance was general in all the districts except Gurgaon, Delhi, Kangra, and Sialkot, and was due to the extreme unhealthiness of the year. Calculated on the approximate population of the province, the number of patients yielded a percentage of 14·34. Of the diseases for which patients sought relief there were 11,321 cases of cholera, being an increase of 7,333 over 1891. Special arrangements were made in each district for the treatment of cholera cases, but the number of such patients who attended at the dispensaries represented a very small proportion of those attacked. Cases of malarial fever rose from 421,677 to 700,784. Diseases of the eye showed an increase of 16,786 cases over 1891, the number treated in 1892 being 267,565. Among the in-patients there were 3,209 deaths during the year, being in the ratio of 60·1 per 1,000 of average strength against a death-rate of 53·9 in 1891. In surgical work there was an increase in minor operations from 185,120 to 186,702, and in those of a major kind from 13,736 to 14,660. Including those remaining from the previous year, the latter numbered 14,998. Among these there were 4,440 cases of cataract, including 146 remaining under treatment from the previous year, of which 82·43 per cent. resulted in cure.

North-Western Provinces and Oudh.

During 1892 there were 16 new dispensaries opened in the North-Western Provinces and Oudh, bringing the total at the end of the year up to 315. Statistics, however, were furnished for only 289, at which the total number of patients who received medical aid was 3,432,351 against 3,067,034 in the previous year. Of these 693,502 were women and 839,065 were children, both showing a marked increase on the figures of the previous year, which were 625,456 and 750,832 respectively. The in-door patients numbered 56,226, as compared with 54,372 in 1891, and among them there were 3,094 deaths, giving a death-rate of 55·0 per 1,000 against 3,357 or 61·7 in the previous year. Of the diseases for which the patients were treated 667,567 were suffering from malarial fevers, an increase of 136,403 on the number of 1891; of cases of cholera there were 9,075 against 8,502, and cases of diseases of the eye also increased from 241,942 to 269,004. The progress of surgical work kept pace with the general increase in the number of patients applying for relief. The number of surgical cases rose from 154,963 to 166,338. These included 25,244 major operations (with 943 remaining from the previous year), of which 19,465 resulted in cure and 370 were fatal. The new dispensaries accounted for 61,905 of the total increase of patients, leaving 303,412, or 9·8 per cent., to the credit of the growing popularity of the older dispensaries.

Burma.

Two new dispensaries were established in Lower Burma during 1892, bringing the total up to 37. At these 298,846 patients attended, as compared with 279,974 in 1891. Indoor patients increased from 17,180 to 18,876, and of these 12,998 were cured and 1,420 or 75 per 1,000 died, against 1,248 deaths or 73 per 1,000, in the previous year. Malarial fevers alone were responsible for nearly one-fifth of the attendance, and next came cases of worms and eye diseases. The number of cholera patients was nearly double that of 1891, being 415 against 214. Surgical work also showed an increase both in major and minor operations, the former having risen from 337 to 418, and the latter from 7,618 to 7,970. The reason why the major operations are so much smaller in number in Burma as compared with the majority of Indian provinces is, Surgeon-Major Dalzell says, the people of Burma being a healthy, well nourished race, there is a paucity of subjects for operation.

In Upper Burma 45 dispensaries were working during 1892, the same number as in the previous year. The total number of patients under treatment was 158,683, of whom 10,840 were in-patients, the corresponding figures for 1891 being 136,444 and 8,575 respectively. In the course of the year 8,912 patients were cured, 258 relieved, 336 discharged otherwise, and 569 died, the deaths yielding a ratio of 52 per 1,000, against 44 in 1891. The Burmese resort to these institutions in greater proportion in Upper than in Lower Burma, the percentage of Burmese to total treated being 51 for the lower part of the province against 59 in the upper part.

Central Provinces.

There were 110 hospitals and dispensaries at work in the Central Provinces during 1892, or one less than in the previous year; but the total number of patients rose from 912,876 to 972,427. The increase extended to both in and out door patients, the former having risen from 8,222 to 8,523, and the latter from 904,654 to 963,904. At several dispensaries useful work was done in making arrangements for the separate out-door treatment of the sexes, and where effected an increase in the attendance of female out-patients was the result. Among the in-patients there were 832 deaths or 97·6 per 1,000 of total treated, a lower rate by 21 per 1,000 than that of 1891. There were 24,378 surgical operations performed against 22,472 in 1891. Of these, 1,615 were major against 1331. Malarial fever cases were much more numerous than in 1891, and in several other groups of diseases there was a considerable increase. Cholera cases rose from 1,775 to 1,908, while dysentery cases declined from 19,763 to 15,480, and diarrhœa from 24,854 to 22,389, but the largest decrease took place in diseases of the eye, the cases having fallen from 98,479 to 94,127.

Assam.

In the province of Assam there were 81 dispensaries open during 1892, at which 369,832 patients were under treatment against 326,846 in the previous year. The in-patients numbered 5,734, as compared with 4,455 in 1891, and of these 2,755 were cured, 421 relieved, 1,153 discharged otherwise, and 1,160 died, the latter representing 202·3 per 1,000 of the total in-patients, against a ratio of 187·6 in 1891. Of the total number of persons who received medical aid, malarial fever, including kala-azar, accounted for 83,846 cases, or about a fourth of the total treated; next came skin diseases, with 72,743 cases, worms 37,901, and diseases of the digestive system 20,213. Cholera patients numbered 2,328. Of surgical cases there were 8,936, including 767 major operations; of the latter, 639 resulted in cure and 24 were fatal. At the request

of the Chief Commissioner of the province an inquiry was made by the Sanitary Commissioner into the work done by the several Local Board dispensaries, with a view to its being determined whether Government aid, in the shape of granting them the services of a Hospital Assistant and European medicines free of charge, should be continued. In consequence of his recommendations the annual grant was discontinued in several cases, and the saving effected has been utilised in making grants to the newly opened dispensaries at the kala-azar centres in the Nowgong and Darrang districts.

Madras. In accordance with instructions from the Government of India, the statistics of State hospitals in Madras Presidency town are now separately reported on. Excluding these there were 443 dispensaries at work in Madras during 1892, or 17 more than in 1891. The results of the year show that 3,106,386 patients were treated, against 2,743,419 in 1891. The in-patients increased from 37,243 to 39,741, and of these 23,914 were cured, 6,319 relieved, 4,458 discharged otherwise, and 3,714 died, the latter representing a ratio of 93·5 per 1,000 of the total. Of the principal diseases under treatment affections of the eye gave the largest number of admissions, yielding 12·01 per cent. of the total; ulcers and diseases of the skin followed with percentages of 11·06 and 9·64 respectively. Surgical operations amounted to 112,540, including 4,391 of a major kind, of which latter 3,557 were cured and 179 were fatal.

In the six institutions of Madras town there were 89,272 patients under treatment during 1892, against 83,860 in 1891. The increase was entirely among out-patients, the in-patients having declined from 14,198 to 13,185, which was chiefly attributable to the omission of 1,528 cases of natural labour, as, under the new nomenclature, such cases are no longer recognised as diseases. The admissions from malarial fever and eye diseases showed a large increase, while diarrhœa and dysentery cases decreased. Of the total in-patients 6,805 were cured, 2,727 relieved, 2,079 discharged otherwise, and 816 or 61·9 per 1,000 died. The results of surgical work showed an increase of 557 operations, the major kind having risen from 3,283 in 1891 to 3,498, and the minor from 8,228 to 8,570. The successful major operations numbered 2,396, and the fatal cases were 89.

At the Madras Voluntary Venereal Hospital, 577 patients were under treatment, an increase of 135 on the number of 1891. Of these 360 cases were of primary syphilis, or 93 more than in the previous year. Cases of gonorrhœa also showed an increase of 28. "The character of the cases," the Superintendent reports, "was very bad; in "fact I have never seen such frightful results from syphilitic poison. Mere children "and old women presented themselves in a shocking state, huge sloughing ulcers, with "great loss of tissue, being common. No such cases were seen during the period the "Contagious Diseases Act was in force; cases only come in now when disease is far "advanced and the system thoroughly poisoned, and they can leave hospital when they "please, many insisting on leaving before a cure is complete, these widely spreading a "bad form of syphilis among the population."

Bombay. Excluding the 11 civil medical institutions of the presidency town of Bombay, there were 258 hospitals and dispensaries working in the mofussil during 1892. At these 1,880,327 patients were under treatment, of whom 28,372 were in-door and 1,851,955 were out-door patients, as compared with 27,777 and 1,705,081 respectively in 1891. The season was generally unhealthy, and it was chiefly to this cause, though partly also to the opening of new institutions, that the general increase of patients was attributed. Cholera, as already stated, prevailed to an unusual extent in the Presidency, and the number of cases of the disease which came under treatment was 5,121, against 2,131 in 1891. Dysentery cases also rose from 25,396 to 32,173, and malarial fever admissions reached the enormous total of 381,837, being an increase of 70,574 on the number reported in the previous year. Of the in-door patients 20,768 were cured, 2,195 relieved, 2,380 discharged otherwise, and 1,809 died, giving a death-rate of 63 per 1,000 of total treated, or 6 per 1,000 more than in 1891. Excluding the 84 surgical cases which remained under treatment from the previous year, 3,835 major operations were performed during 1892, and of the total 3,115 were cured, 288 relieved, 69 discharged otherwise, and 128 proved fatal. The total number of minor operations was 85,494, against 77,882 in 1891.

At the 11 civil medical institutions working in the city of Bombay during 1892, there were 113,372 persons under treatment, of whom 18,419 were in-door patients. Of these 10,432 were cured, 4,301 relieved, 1,133 discharged otherwise, and 1,556 died, this mortality being at the rate of 84 per 1,000 of the total treated, as compared with 88 per 1,000 in 1891. As usual malarial fevers gave the largest number of admissions, 14,579 or 12·9 per cent. of the total treated, and venereal affections contributed

5,428 cases, or 4·8 per cent. Cholera cases declined from 74 to 18, and those of dysentery from 1,761 to 1,627, while cases of diarrhœa rose from 3,056 to 3,345. There were 24,019 minor and 2,429 major operations performed. Including 50 cases which had been operated on in the previous year, the total of the latter was 2,479, and of these 2,327 were cured, 30 relieved, 20 discharged otherwise, and 70 ended fatally.

Berar. The same 44 civil hospitals and dispensaries were open in Berar during 1892 as in the previous year. The total number of patients under treatment was 296,091 against 282,751 in 1891. Of these 3,858 were in-patients, of whom 3,367 were cured, and 151 died, which gives a death-rate of 39·1 per 1,000 as compared with a mortality of 202, or 58 per 1,000 in 1891. A large proportion of the deaths, however, were due to patients being brought in at the last stage, or about the last stage, of the disease they suffered from. Malarial fevers continued to head the list of diseases from which relief was sought, and showed a marked increase of cases over the preceding year; more than a fifth of the total patients were treated under this head; diseases of the eye and skin came next in order. Cholera cases declined from 2,295 in 1891 to 1,148; there was also a smaller number of admissions from bowel affections. Surgical work showed progress. The number of major operations performed was 397 against 242 in 1891, and of minor operations 10,890 against 9,971.

Lunatic Asylums.

Bengal. At the five asylums in Bengal (viz., Calcutta, Dacca, Patna, Cuttack, and Berhampore) 1,149 lunatics, including 186 fresh admissions and re-admissions, were under treatment in 1892, being a decrease of 85 on the number of the previous year. In the course of the year under notice 71 patients were discharged as cured, and 43 otherwise, and 84 died. Compared with the figures of 1891, the admissions were fewer by 27, and the discharges and deaths together by 83. At the end of the year there were 951 persons still under detention, or 12 less than at the close of 1891. The health of the inmates of the asylums was again remarkably good, and the number of admissions to hospital declined from 717 in 1891 to 595. With the exception of six cases of small-pox in the Dacca Asylum, there was no special occurrence of serious disease. Notwithstanding that cholera prevailed severely during the year, there was no instance of the disease in any of the asylums. The total mortality showed an increase on the previous year, the death-rate being 87·4 per 1,000 of average strength against 80·2 in 1891. During the year the Government of India suggested that the practicability of establishing dairy farms in connexion with the Bengal Lunatic Asylums might be taken into consideration. It appears that at Dallanda a dairy farm has been in successful operation since 1889, and steps were being taken to extend it. A dairy farm is also attached to the Dacca Asylum. Action was about to be taken with a view to starting this experiment in the other three asylums.

In the Bhowanipur Asylum, containing European and Eurasian patients only, the population during 1892 was 61, or 11 more than in the previous year. Of this number 35 were under detention at the beginning of the year, and 26 were subsequently admitted, including nine criminal lunatics. In the course of the year 17 patients were discharged cured, one was despatched to Europe under the Merchant Shipping Act, four were transferred to the care of friends, one was deported to Europe as still insane, and two died, leaving 35 under detention, the same number as at the close of 1891. There was no want of accommodation, and the health of the patients was good throughout the year. The question of closing this asylum and transferring the patients to the Dallanda Asylum has been abandoned for the present, the committee to whom the matter was referred not being able to recommend any practicable and economical arrangement.

North-Western Provinces and Oudh. The population of the four lunatic asylums (Agra, Bareilly, Benares, and Lucknow) in the North-Western Provinces and Oudh in 1892 was 1,281, including 274 admitted during the year, against 1,278 in 1891. Before the close of the year 202 patients were discharged, of whom 132 were reported as cured, and 66 were made over to friends, and 93 died, leaving 986 under treatment at the end of the year. The year was somewhat unhealthy, and the death-rate per 1,000 of average strength rose from 86·4 to 90·8, the increase being due to a severe outbreak of influenza in the Bareilly Asylum, and to the prevalence of malarial fevers in the Agra and Lucknow Asylums. Of the 93 patients who died, more than half the number were admitted into the asylums in bad or indifferent health. During the year the Agra Asylum was connected with the

new water supply at that town. Various other improvements were either projected or taken in hand at the other asylums, and the Lieutenant-Governor hoped that by the close of 1893 the extensive buildings elaborated for Lucknow, an asylum which for some time past has given cause for anxiety, would be completed.

Punjab. The total number of lunatics in the Lahore and Delhi lunatic asylums in the Punjab during 1892 was 472, including 132 fresh admissions, against 432 in 1891. At the end of the year the number was reduced to 341 by the discharge of 61 patients (44 as cured, and 17 made over to friends), three escapes, and 67 deaths. The year being a very unhealthy one, both sickness and mortality in the asylums were much greater than in 1891. The cases in hospital numbered 766, or 234 more, but the increase was confined to Lahore, as in Delhi there was a decrease of nine admissions. Of the 67 deaths, which yielded a ratio of 142 per 1,000 against 74 in 1891, the Lahore Asylum recorded 52, equal to a ratio of 210·2, and of these 20 were admitted in bad health. Cholera accounted for 12 deaths, "so that altogether the "apparent causes and conditions acting during the year 1892 were of themselves "sufficient to account for a high mortality." In the Delhi Asylum there were 15 deaths or 156·1 per 1,000, against 12 or 130·2 in 1891. Pneumonia was the chief cause of mortality in this asylum, and accounted for five deaths; from cholera there was one fatal case.

Burma. The Rangoon Asylum is the only one in the province of Burma. The accommodation it provides being inadequate, a number of lunatics are confined and treated in a part of the Rangoon central jail. It was intended to build a new asylum at Mandalay to meet the increase in the number of lunatics, but owing to financial exigencies the scheme has been abandoned. It has now been determined to enlarge the present asylum, so as to provide adequately for the accommodation of lunatics from all parts of the province. During 1892 there were 356 lunatics in the Rangoon Asylum, including 102 fresh admissions, and the total was reduced at the close of the year to 265 by the discharge of 64 for different causes and the death of 27. The health of the lunatics was not so good as in 1891; there were 113 admissions to hospital as compared with 75, and the deaths rose from 22 or 80·5 per 1,000 of average strength to 27 or 102·0. No less than 23 of the new cases were in bad and indifferent health on admission, and nine of the 27 deaths occurred among persons admitted during the year.

Central Provinces. In the two asylums of the Central Provinces (Nagpur and Jubbulpore) there were 323 lunatics under treatment during 1892, and of these 62 were fresh admissions. In the course of the year 33 patients were discharged as cured or otherwise, and 11 had died, leaving 279 still under treatment at the commencement of 1893. The year under notice was a fairly healthy one in both asylums. There was no overcrowding, and they were free from cholera, but the epidemic of influenza affected both, causing 16 admissions to hospital at Nagpur, and nine admissions and one death at Jubbulpore. The chief cause of sickness was, as usual, malarial fever, which caused 53 admissions at Nagpur and 27 at Jubbulpore. There were only 10 admissions from bowel complaints (three at Nagpur and seven at Jubbulpore), indicating "that the food and the "water supply are good at both institutions." Of the 11 deaths, Nagpur recorded three, which represented a ratio of 22·9 per 1,000 of the average strength, being the lowest recorded in 10 years. At Jubbulpore the deaths fell from 15, or 112·1 per 1,000 in 1891 to 8 or 57·2. Four of the deaths at this asylum were those of very old and weakly persons. Extensive structural improvements were completed during the year at Nagpur, and at Jubbulpore new latrine accommodation was provided.

Assam. There is only one lunatic asylum in the province of Assam. This is situated in Tezpur, and the building is reported to be at present large enough for all demands on it. The total number of lunatics under treatment in the asylum during 1892 was 154, being a decrease of 13 on the number of the previous year. Of these 43 were fresh admissions. At the close of the year the population of the asylum was reduced to 110, 36 of the total number having been discharged, five died, and three escaped. There was a substantial reduction in sickness as well as in mortality as compared with the results of 1891, the ratio of admissions to hospital per 1,000 of average strength having declined from 585 to 435, and the death-rate from 150·4 to 44·4 per 1,000. Although cholera was prevalent among the civil population, only one suspected case occurred in the asylum, which was segregated and cured. Of the five deaths, phthisis claimed two, and chronic dysentery, pleuro-pneumonia, and epilepsy one each. The

Chief Commissioner visited the asylum in January 1893, and was generally satisfied with the results of his inspection.

Madras. At the commencement of 1892 there were 592 patients under treatment in the three lunatic asylums (Madras, Calicut, Waltair) of the Madras Presidency. During the year 245 fresh cases were admitted, bringing the total population up to 837, or 27 more than the number in the preceding year. In the course of 1892 there were 181 cases of discharge, and of these 77 were cured. The results of the year were, on the whole, favourable. The accommodation in the asylums was ample, and there was an increase in the percentage of cures, and a decrease in the death-rate. There were 104 deaths, equal to a ratio of 182·2 per 1,000 of average strength, against 114 or 185·7 in 1891. The decrease in mortality, however, was confined to Madras Asylum, whose death-rate fell from 230·9 per 1,000 to 173·4. The other two asylums showed a large increase, the death-rate of Calicut having risen from 92·1 to 202·5, which was chiefly due to an outbreak of cholera, and that of Waltair from 76·0 to 209·8. This asylum was free from cholera, and the high rate of mortality represented only nine deaths. In Madras Asylum there were nine cholera cases, with eight deaths. In both the asylums affected with cholera active measures were adopted, including isolation of those attacked, and the spread of the disease was successfully combated. Of the total number of insanes under treatment, 225 belonged to the criminal class, and of these 62 were discharged or transferred and 18 died.

Bombay. The total population of the six lunatic asylums of the Bombay Presidency (Colaba, Ratnagiri, Poona, Dharwar, Ahmedabad, and Sir Cowasji Jehangir, Hyderabad) rose from 961 in 1891 to 999 in 1892, including 290 fresh admissions. In the course of the year 174 patients were discharged, 91 of them as cured, and 112 died, leaving 713 under treatment at the close of the year. There was slightly more sickness in the asylums than in 1891, and the death-rate rose from 98·1 per 1,000 of average strength to 151·8. Of the 112 deaths 27 were due to dysentery, 21 to diarrhœa, 13 to phthisis, and 11 to remittent fever. The increase of 42 deaths was spread over all the six asylums. At Colaba the high death-rate of 163·3 was due to dysentery, diarrhœa, and phthisis during the rains and the cold weather. At Poona the death-rate of 202·1 was due chiefly to diarrhœa and debility among inmates admitted in a weak and debilitated condition. And the high death-rate of Hyderabad of 222·0 was attributed to the exceptional unhealthiness of the hot season, "the principal feature of which "was the unprecedentedly high inundation of the Indus, the level of which was "3 to 4 feet above that of the asylum ground. After the inundation subsided, "malarial fever and pneumonia appeared in a virulent type both among the lunatics "and the asylum establishment."

Medical Schools.

Bengal. The number of medical schools open in Bengal during 1891–92 was 10, the same as in the preceding year. The Medical College, Calcutta, is affiliated to the University, and prepares candidates for its various medical degrees. The four Government medical schools train pupils as Civil Hospital Assistants, and the unaided schools follow their own standards for private practice. The total number of pupils attending the various medical schools in the province rose from 1,290 in 1891–92 to 1,545 in 1892–93.

On the opening of the session in the Calcutta Medical College, 255 students resumed their studies, seven rejoined, and 139 new students were admitted, making a total of 401, against 322 in the previous year. The strength of the College at the close of the session was reduced to 281. As regards the examinations, 56 candidates (including 1 female) passed the Preliminary Scientific L.M.S. examination; 27 passed the First L.M.S.; 10 passed the Second L.M.S.; 13 passed the Preliminary Scientific M.B.; 9 passed the First M.B.; 2 passed the Second M.B.; and 1 passed in Honours in medicine. Eleven military pupils passed and left for regimental duties; 10 Native *dais* passed in midwifery from the Eden Hospital and received certificates of qualifications, and 13 pupil-nurses also passed as midwives.

The Campbell Medical School had 297 pupils on its rolls on the 31st March 1893. Out of 73 male and 4 female second year students, 57 and 4 respectively passed the first license examination. For the second or final license examination there were 61 candidates, including 7 females, and of these, only 18 male students and 5 females were successful. In the compounder class there were 81 males and 1 female.

At the Dacca Medical School there were 180 pupils on the rolls, 5 being in the fourth-year class, 36 in the third-year class, 62 in the second-year class, and 77 in the

first-year class. Twenty-eight students of the third-year class passed the final examination, and obtained their diplomas as vernacular licentiates; and 25 students of the second-year class passed the junior diploma examination and were promoted to the third-year class.

The Temple Medical School, Patna, had 183 students on its rolls, an increase of 56 compared with the previous year. Out of 37 students who competed for the second license or the final examination 23 passed; and 33 pupils of the second-year class passed the first license examination out of 49 who competed. The results of the compounder class were on the whole satisfactory; ten obtained certificates during the year, of whom 6 were taught in the school, and 4 came up from outside.

At the Cuttack Medical School there were altogether 86 pupils. Out of 21 third-year pupils, 17, including a native Christian girl, passed the final examination and received diplomas; and of the 21 pupils of the second-year class, 19 were promoted to the third-year class. There were no candidates during the year for the compoundership examination.

Good work was also being done in the diffusion of medical knowledge among the people of Bengal by private enterprise. There are five unaided medical schools, three at Dacca and two at Calcutta.

North-Western Provinces and Oudh.

The number of pupils of the various classes of the Agra Medical School who attended the examination at the close of the year 1892–93, was 203 as compared with 213 at the end of the preceding year. At the final examination 31 out of 43 candidates passed. For the first time since 1887 the military students beat the civil and private students at the final examination. Students who completed their course of training in three years thus gained a higher number of marks than those who passed the four-year course prescribed for them. The civil class is composed of two kinds of pupils; first, candidates for Government service, who receive scholarships as well as a free education, and who are bound to serve Government for a certain period if required to do so, and secondly, pupils—some of them medical missionaries, who, though they do not receive scholarships, pay no education fees, and are under no obligations of any description. The private students, however, did well as a class compared with other years, five out of eight of them having succeeded in obtaining diplomas. Of the 43 female pupils, seven were fourth-year students, and five of them succeeded in passing their final qualifying examination. A Hindu student passed highest in the female list and gained two medals. She is a private student and intends setting up in practice on her own account in Meerut, her native place. At the intermediate examinations, the female students were not so successful, only 10 out of 21 second-year students having passed. The failure was attributed to the low standard of general education of the female pupils, a matter which was receiving the attention of the Local Government.

Punjab.

The total number of students at the Lahore Medical College and School during 1892–93 was 397 against 322 in the previous year. Of these 158 (including 10 females) were in the College Class, and 239 (including 8 females) were in the Medical School. Of late years the College has developed very rapidly. In 1887–88 the number of students was 61, and in 1892–93 they had increased to 158. There has also been a satisfactory increase in free students. During the same period they have risen from 18 to 93, but the increase of free students in the year under notice, from 79 in 1891–92 to 93, took place among students from the North-Western Provinces, of whom there were 16 more than in the previous year, as the number of Punjab free students fell from 66 to 64. At the College examinations 40 candidates presented themselves for the junior examinations in the Assistant-Surgeon class, and of these 12 or 30 per cent. were successful in all subjects. At the final examination 15 passed out of 25, equal to 60 per cent., which compares very favourably with the results of the previous year, when only 8 or 42 per cent. out of 19 passed the required test. Out of 50 candidates in the Hospital Assistant class, 30 or 60 per cent. were successful. In the previous year 73·6 per cent. of this class passed the necessary examination.

Madras.

The total strength of the Madras Medical College during 1892–93 was 480, being a decrease of 7 on the attendance of the previous year. Of these 35 were female students against 41 in 1891–92. In the Hospital Assistant Department, consisting of 284 pupils, 52 appeared for the final examination and all but two passed successfully. The results of the several University examinations show that a larger number of candidates were successful as compared with the previous year, 64 having passed on the whole out

of 125 candidates entered, against 32 out of 122 in 1891–92. Fewer students sought admission into the L.M.S. classes, owing to the circumstance that, in consequence of the raising of the standard of admission, under the revised byelaws of the University, matriculates would have but one chance of competing for the L.M.S. examination.

The Board Medical School, Nellore, had 38 pupils (including five Mohammedans) on its rolls. Four students appeared for the final examination for the Hospital Assistant grade, and all passed, two of them being placed in the first class. At the Prince of Wales' Medical School, Tanjore, there were 22 pupils, 12 of whom were native Christians, five Brahmans, and the remainder non-Brahman Hindus. Eleven candidates appeared for the Hospital Assistant examination, and all passed, the Government gold medal being won by a student from this school.

Bombay.

The attendance at the Grant Medical College, Bombay, rose from 222 in 1891 to 239 (including 29 females) in 1892. For the first University examination in medicine there were 71 candidates, of whom only 38 were successful; and for the second examination in medicine 34 passed out of 55 candidates. For the L.M.S. examination there were 48 candidates, and only 17 were successful. As usual, the greater proportion of the failures were those who had already failed on previous occasions. In reporting on the general progress of the students, the Principal expresses himself as thoroughly satisfied with the results of the improved laboratory training on the attainments of the students, and considers that the instruction given in physiology and chemistry can compare favourably with that of any medical school of the United Kingdom.

The Government Medical Schools at Poona, Ahmedabad, and Hyderabad continued to work satisfactorily. The number of students was 201, and of these 53 passed the third year examination.

VII.—SANITATION.

Civil.

Bengal.

Much useful sanitary work was executed in Calcutta during 1892, especially in the extension of drainage and water supply, and the improvement of bastis. On the latter nearly 8¾ lakhs of rupees have been expended during the last ten years. The drainage system of the town proper has been virtually completed for some time, but improvements continue to be carried out when necessary. A large flushing reservoir holding 300,000 gallons was constructed in the course of the year near the Bhowanipur pumping station, and provision has now been made for a large extension of the flushing system. Much, however, remains to be done in the added or suburban area, where, it is reported, there are some 200 miles of open drains which can be adapted and used for surface drainage. This matter was receiving the careful attention of the Commissioners, and a great advance in this direction was shortly expected. By the construction of two new settling tanks the daily supply of filtered water per head of population in the town has been increased to 37·32 gallons, and in the added area to 17·58 gallons. Eighteen miles of distribution pipes were laid, bringing the total up to 285·73 miles, and the number of premises supplied now reaches 22,831. In addition to the town supply, Barrackpore was provided with an average of 128,118 gallons daily throughout the year. The unfiltered supply for bathing, flushing drains, and street watering amounted to 4,320,879 gallons. Steps were being taken for extending the benefits of pure water to areas outside the limits of the municipality, the Commissioners during the year having agreed to supply the Maniktala municipality with filtered water up to a maximum of 10 gallons a head at a cost of four annas per 1,000 gallons, and a scheme for supplying other municipalities was in preparation. Calcutta was further improved by the completion of the Harrison and Lansdown Roads which are described as fine works.

The municipalities of the interior of Bengal spent Rx. 147,871 on sanitation, being an increase of Rx. 14,114 on the sum expended in 1891. In improving town and rural areas the local bodies spent Rx. 33,466, and a further sum of Rx. 31,917 was contributed by private individuals, the most important work undertaken being the construction of waterworks at Nasirabad in the Mymensingh district by Raja Surya Kanto Acharji Bahadur, at a cost of Rx. 14,276. No sanitary works of any great importance were carried out during the year, but as the Army Sanitary Commission notice "there is evidence that a decided desire for such improvements had been awakened," for the demand by local bodies for surveying instruments which the Government had purchased for the use of the Sanitary Board was so great that several more sets had to be obtained. The Sanitary Commissioner in his report for the year under notice gives a graphic description of the insanitary condition of Bengal villages, "rural sanitation being virtually unknown in the province." In his resolution on Dr. Gregg's report the Lieutenant-Governor remarks that the sanitary question in Bengal, in its various phases of silting-up deltaic rivers, obstructed drainage, uncleanly towns, and unhealthy villages, is the pressing question of the day, and that early action will have to be taken to solve it.

The Bengal Sanitary Board was not able to hold more than one meeting during the year, owing to the frequent absence of some of the members on tour. Among the more important matters which came under their consideration were the drainage and water-supply of the town of Pubna, and the drainage of the towns of Dinajpur and Jamalpur. Several projects for water-supply and drainage, proposed by Municipal Commissioners and District Boards were also submitted to the Sanitary Board, in fact they became so numerous that the Lieutenant-Governor found it necessary to define the duties of the Board with regard to the preparation of such projects, and precise instructions on the subject were issued.

North-Western Provinces and Oudh.

Satisfactory progress was made in sanitary work in the North-Western Provinces and Oudh during 1892. The supply of Agra and Allahabad with filtered water from water-works which were completed in 1890 and 1891 respectively, has resulted in an improvement in the death-rates of these towns, but the advantages of an improved water supply appears to be counterbalanced somewhat by indifferent conservancy or drainage. The Benares waterworks were completed and opened on the 18th November

of the year under notice by the Lieutenant-Governor, and the works in connexion with an extensive drainage scheme were commenced. At Lucknow and Cawnpore the construction of waterworks was commenced, and schemes for improved water-supplies for Mussoorie, Rajpur, Dehra, and elsewhere were in progress or proposed. At Naini Tal a drainage and sewerage scheme was approaching completion, and projects for the drainage of Cawnpore, Farukhabad, and Jhansi were under consideration. In many towns the drainage and private conservancy arrangements are still defective and require, the Government observe, the close attention of the local authorities. It was proposed to deal with certain of the smaller towns under the Village Sanitation Act which became law on the 19th January 1893.

The question of the reconstitution of the Sanitary Board of the province was before the Government during the year, but final orders on the subject had not been issued at the close of the year. So far the functions of the Board have been purely of a consultative nature, there being no executive authority. It advised on many important matters, and drafted the Village Sanitation Bill, which, as stated above, has now become law. The more urgent projects for the relief of obstructed drainage in certain tracts have for some time engaged the attention of the Board, and the important question of carrying into effect the above Act has now been referred to them for consideration.

Punjab.

The expenditure on sanitary works in the municipalities of the Punjab during 1892 amounted to Rx. 147,243 against Rx. 120,469 in the previous year. Several important works were either completed or in progress during the year. The Delhi and Abbottabad waterworks were completed, and the former was formally opened by the Lieutenant-Governor in November; a part of the Delhi drainage scheme was sanctioned, and a loan of three lakhs was promised the municipality to carry out the project. At Simla the extension of the waterworks and the sewerage improvements were making rapid progress. The waterworks for the town and cantonment of Kohat were being pushed on, as were also those of Dalhousie and Murree; while schemes for supplying Bhiwani in the Hissar district, Umballa, Mooltan, Sialkot, Amritsar, Wazirabad, and Haripur with water were under consideration. Great improvement was effected in the drainage of Peshawar, and the intro-mural drainage works at Gujranwala were nearing completion; projects for the drainage of several other places were either in progress or under consideration. Several sanitary works of public utility were also constructed during the year by private individuals. Manure and town sweepings continued to be utilized to a considerable extent in the different municipalities, and in 1892 the large sum of Rx. 12,880 was realised by their sale.

The Sanitary Board held six meetings during the year, at which they considered and recommended the adoption of improvements in the rules for the collection of vital statistics, which were approved by Government. They also recommended the appointment of a first-class executive or superintending engineer to their body, as suggested by the Army Sanitary Commission in their memorandum on the Sanitary Commissioner's report for 1890. With regard to this proposal, it is reported that a scheme has been worked out for the employment of a sanitary engineer, the cost of the appointment to be recovered from municipalities at a percentage of their incomes. Municipalities have been asked for their views on this matter.

Burma.

The expenditure by the Public Works Department of Burma on sanitary works and improvements during 1892 amounted to Rx. 2,017, including Rx. 860 on water-supply in the lower portion of the province, and to Rx. 2,475, including 1,548 on water-supply, in the upper portion. This expenditure was, for the most part, devoted to the erection of latrines, and other minor improvements. Much activity is reported to have been displayed throughout the larger towns of the province in the matter of conservancy. Considerable progress was made in closing cesspits, "which may be truly described as the "bane of all the large towns in Burma." In Rangoon the Shone and Ault sewerage system continued to work successfully, and the number of house connections was doubled. "It is gratifying to find," the Sanitary Commissioner writes, "that, as "the houses become connected with the sewerage system, the death-rate in areas "which are served by this means steadily decline." The proposal of the Municipal Committee to borrow 7 lakhs of rupees for increasing the pressure on the water-supply of the town, the present pressure being inadequate, was sanctioned by the Local Government. Another important measure for the welfare of Rangoon, which is now in operation, is the reclamation of the low-lying lands in the east of the town. The schemes include an extensive programme of reclamation, distributed over a period

of five years, and costing 15½ lakhs, the greater part of the expenditure being met from the proceeds of the sale of Government lands in other parts of Rangoon. The water-works at Prome continued to work satisfactorily, and the water supply of Akyab was much improved. The scheme for supplying the town of Mandalay with water was still under consideration though well advanced.

The Sanitary Board was in existence throughout the year, but had not much progress to report; the Board was mainly occupied in considering the surveys of selected towns. The proposal to appoint a sanitary engineer to the Board has been abandoned for the present.

Central Provinces.

A good deal of sanitary work of more or less importance was accomplished in the Central Provinces during 1892. The Raipur waterworks were opened by the Chief Commissioner on the last day but one of the year. The population present and prospective supplied is 28,000 and 40,000 respectively, and the rate allowed is 10 gallons a head for 12 hours. In his remarks on these works the Sanitary Commissioner says, "I have specially to note the excellent principle on which these "works are made. Those at Jubbulpore and Nagpur are of the nature of the ordinary "Deccan tanks for surface water. Extensive catchment areas have to be conserved, "and there is no filtration. In the Raipur works the source is not the river directly, "but the subterranean percolation stream that attends it, and there is no trouble with "catchment area or filter beds. The river bed with its shifting alluvia is the filter. "The results are excellent. The water is perfectly clear and transparent, and has "the character of filtered river water, and the natives find it answers their test of "softness, cooking and all, properly." The waterworks of the town of Berhampore were improved, the estimated cost being Rx. 14,128. An estimate for supplying the town of Rajnandgaon with water on the Raipur system was sanctioned, and the work was in progress. The Raipur water supply was improved by the laying of a second main, and the Harda and Khandwa waterworks surveys were completed. Drainage surveys were carried out for the towns of Jubbulpore, Nagpur, Saugor, Bilaspur, and Sambalpur. The municipalities expended a sum of Rx. 24,687 on sanitation, over Rx. 19,000 of which were devoted to conservancy.

The Sanitary Board, which was strengthened by the addition of the Chairman of the District Council, held 15 meetings in the course of the year. Under the direction of the Board important minor sanitary works were carried out, consisting chiefly of improvements of village water supplies by construction of new wells, improvement of others, and special attention was given to the provision of pure water for the lower castes. The drainage and cleansing of village sites also received careful attention. The expenditure in all districts on works sanctioned by the Sanitary Board, was approximately Rx. 7,643. "A substantial beginning," the Government observe, "has "been made in every district of the province, an expenditure on village sanitation "falling not far short of a lakh of rupees having been most usefully and profitably "incurred."

Assam.

No sanitary work of any great importance was executed or undertaken in Assam during 1892, but good progress was made in carrying out sanitary improvements generally. The ratio of expenditure on sanitary works to the total income of the municipal bodies advanced from 54·7 per cent. in 1891 to 60·3 in 1892. The Chief Commissioner of the province was satisfied that village sanitation was receiving the careful attention of the Local Boards, and that with the limited income at their disposal expenditure on sanitation had been on the whole judiciously incurred. An addition has since been made to the provincial grant to Local Boards, with the promise of a further increase, and "with these extra funds at their disposal the Chief Commis-"sioner expects that every Local Board will increase its annual expenditure on "sanitary works, and more especially in the direction of supplying good wells to every "large village, as well as to every important market held outside municipal limits."

The constitution of the Sanitary Board remained the same as in the previous year. The Chief Commissioner decided that instead of the Board holding formal meetings as hitherto, all correspondence relating to village sanitation should be circulated for the opinion of members. During the year the Board appears to have been occupied mainly in considering the improvements of water supply, drainage, and conservancy of villages.

Madras.

Sanitary work executed in the Madras municipality during 1892 was of a minor character. The question of improving the drainage and water-supply of the city was

still under the consideration of the Municipal Commissioners, the report of the expert (Mr. Cousins) who had been deputed to investigate the matter not having been received at the close of the year. The President of the Municipality says "the people of "Madras, generally, are fully alive to the benefits of sanitary work, so long as their "own interests are not touched, and they are not required to take any personal "trouble. . . . The great block to sanitary progress is the extreme poverty of "the town, in consequence of which the municipal funds have hitherto proved "insufficient for the most necessary sanitary works. The most hopeful sign is that "the people are so fully alive to their own sanitary wants."

In the other municipalities of the Presidency, numbering 55, the bulk of the sanitary work consisted in the sinking and repairing of wells, construction and repair of drains, public latrines, markets, &c. The sum assigned for sanitary improvements was Rx. 153,948 equal to 60·3 per cent. of the year's municipal income, and during the first nine months more than half of the amount was spent for this purpose. The District Boards also allotted Rx. 63,174, or 8 per cent. of their income, for sanitary purposes, the work executed being similar to that carried out in the municipalities. On the whole sanitation in the Presidency received increased attention during the year, but there is still much room for improvement. "There is no doubt," the Sanitary Commissioner remarks, "that progress in sanitary matters is being made in most "municipalities, and that many chairmen and municipal councillors are thoroughly "aware of the close relation that exists between sickness and mortality from which "the people annually suffer and the insanitary conditions among which they live, and "as far as lies in their power, do all that is possible, with the means at their disposal, to "remove existing defects and adopt measures to protect the public health. Many "insanitary defects, however, still exist in all towns, and their removal must be a "work of time and require a large expenditure of money."

In the Sanitary Engineering Department considerable progress was made in sanitary work. The Army Sanitary Commission consider the Report of the Sanitary Engineer a very gratifying record, and sets an example "which might be followed with great advantage by other provinces." Thirteen towns were surveyed and levels taken in connection with projects of water-supply and drainage, and in seven others preliminary steps were taken to allow of the preparation of similar schemes. Nine water-supply and drainage works, estimated to cost Rx. 146,100 in the aggregate, were in course of construction during the year. Of these, two, viz., the Kandal drainage and south water-supply schemes in Ootacamund were completed, while satisfactory progress was made with the water-supply works at Madura and Cuddapah, the Coonoor and Kumbakonam drainage schemes, and the realignment of the Ootacamund main sewer. The Trichinopoly and Tanjore water-supply schemes were put in hand too late to admit of much work being done within the year. Schemes for the improvement of water-supply in five towns, and for that of drainage in another, estimated to cost some Rx. 241,800, were submitted to Government. Of these, the Bellary, Cocanada, and Coimbatore water-supply projects were abandoned as beyond the means of the Municipal Councils and the others, viz., a drainage scheme for Negapatam and water-supply projects at Ongole and Kurnool, were under consideration. The Department also scrutinised 165 plans and 202 estimates for sanitary works of the value of Rx. 21,771, and furnished plans and designs wherever necessary.

The Madras Sanitary Board consists only of two members, the Sanitary Commission and the Sanitary Engineer, who exercise a general supervision over the municipalities and local boards.

Bombay.

The expenditure of the Health Department of the City of Bombay on sanitary measures during 1892 was Rx. 117,552. By the introduction of the Tansa supply, the quantity of water was increased from 16½ to 29 millions of gallons, and the number of house connections rose from 18,113 to 18,486. Various improvements were carried out in the drainage of the city, but there is still a great want of proper drainage in many parts. The Health Officer points out that in some districts, where the daily water supply is equal to 60 gallons per head of population, there are no drains for carrying off subsoil water or drainage, and that in the new undrained districts the people may be said to be living amongst sewage. Steps have already been taken to remedy this state of things on the lines recommended by that officer. Just before the close of the financial year the Corporation sanctioned an expenditure of Rx. 70,961 for the sewerage of Colaba on the Shone system, and the work was at once taken in hand.

In the other municipalities Rx. 81,925 were devoted to conservancy. The principal works in progress were the drainage schemes at Hyderabad and Karachi, and the waterworks at Hubli and Dhulia, which were nearing completion. The Ahmedabad waterworks, which were opened in the previous year proved a great success, and the number of applications for house connections was so large that the municipality was unable to comply with them fast enough. Schemes for supplying Surat, Thana, and Kalyan with water were under consideration. The drainage works completed for part of the Ahmedabad city were working satisfactorily, and a scheme for the surface drainage of Nadiad was sanctioned. Besides these a large number of works for the improvement of the water-supply of the small municipal towns was completed or in progress.

The Sanitary Board, consisting of the Sanitary Commissioner and the Sanitary Engineer, who was appointed early in 1892, had under their consideration during the year many important projects for water supply, drainage plans, and estimates, also improvements of public conveniences, such as latrines and urinals, regarding which they submitted new designs to Government.

Berar.

Good work was effected during 1892 in Berar in connection with sanitation in municipalities and districts, but much still remains to be done to improve the drainage, water supply, and conservancy of towns and villages. It is only in some of the municipal towns, it is reported, that any attempt at systematic drainage exists. The municipalities spent 61·1 per cent. of their total income (Rx. 22,152) on sanitary works, as compared with 48·6 per cent. in 1891. Much attention was paid to conservancy in the municipalities, the expenditure under this head amounting to 23·8 per cent. of income. The only important work in progress was the water-supply of Akola at Kapsi, on which a considerable sum was expended. A complete system of drainage for Amraoti city was to be put in hand as soon as funds were available. Excluding municipalities a sum of Rx. 14,857 was spent by districts on village conservancy and minor sanitary improvements. In addition the Public Works Department spent Rs. 12,799, chiefly on the improvements of water supply.

Some progress was made by the District Sanitary Boards. They met once during the year at each head-quarter station, and were chiefly occupied in projects for improving the sanitary condition of villages. They discussed the sanitation and water-supply of 140 villages, in 41 of which improvements in these matters have been completed, and in the remainder want of funds prevented any action being taken. Regarding the Village Sanitary Boards, the Sanitary Commissioner was not impressed with the work done by them. "From what I have seen" he says, "the sanitation of "the villages where these Boards exist is no better than those where they do not "exist."

W. T. Ronson.

India Office,
13th September 1894.

ABSTRACTS

OF

SANITARY AND OTHER REPORTS

FOR

1892.

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ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1892.

(Surgeon-Major General W. R. Rice, M.D.)

European Troops.

Chiefly owing to the prevalence of influenza and malaria, sickness and mortality in the European army of India were, as may be seen in the following table, considerably increased. Sickness and mortality in 1892.

Abstract of Statistics of European Troops in India.

Year.	Average Annual Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths.	Invaliding.	Total Loss.
1870–79	57,742	1,475	60	19·34	43	62
1881–90*	61,399	1,471	73	14·24	27	42
1882–91	62,229	1,448	74	14·17	26	40
1891	67,030	1,3[illegible]9	79	15·89	27	43
1892	68,137	1,517	84	17·07	24	41

* Including troops in Afghanistan during 1881.

The chief causes of admission were ague, venereal diseases, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission rates were influenza (12·7 per 1,000 against 5·5), remittent fever (13·1 per 1,000 against 6·8), ague (429·1 per 1,000 against 343·5), venereal diseases (409·9 per 1,000 against 400·7), simple continued fever, and respiratory diseases. On the other hand, the admission rate from cholera was reduced from 3·8 to 2·5, the admission rate from alcoholism from 7·5 to 4·3, and the admission rates from tubercle of the lungs, dysentery, and diarrhœa were also lessened. Ague caused 28 per cent. of the total sickness, and venereal diseases 27 per cent.

The chief causes of mortality were enteric fever, cholera, remittent fever, hepatic abscess, heatstroke, tubercle of the lungs, dysentery, and pneumonia. Among the diseases with increased mortality were remittent fever (1·10 per 1,000 against 0·42), small-pox, dysentery, hepatic abscess, tubercle of the lungs, and pneumonia. On the other hand, mortality from cholera (1·78 per 1,000 against 2·51), enteric fever, and injuries was lessened. Enteric fever caused 32 per cent. of the total deaths, and cholera 10 per cent.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial fevers, mental diseases, tubercle of the lungs, rheumatism, dysentery, hepatitis, injuries, valvular diseases of the heart, and palpitation.

A new arrangement begins in this present report with regard to the statistics of ten-year periods. In each year's report some tables are now to be devoted to the statistics of the preceding ten years. In addition to this, at the end of each census-decade, a short comparison will be made of its statistics with those of former like periods. The decision of the Government of India that the decades shall correspond with those of the census explains why 1881–90 is here taken as the decade for comparison with 1870–79, the year 1880 being dropped. In the way just described, the progress of sanitation from decade to decade will be indicated, while readers of the Annual Report will always have at hand the means of seeing how the year under review compares with the preceding 10 years taken as a whole, and also, though less fully, with each of the 10. The following two tables compare the health statistics of the decennium 1881–90 with those of the decennium 1870–79, and in the case of Bengal, the only presidency for which the figures are available, with those of the decennium 1860–69.

Admitted per 1,000 *of strength.*

ADMISSIONS FROM	INDIA.		BENGAL.			MADRAS.		BOMBAY.	
	1881–90.	1870–79.	1881–90.	1870–79.	1860–69.	1881–90.	1870–79.	1881–90.	1870–79.
Ague (*a*)	398	389	459	425	439	195	140	409	528
Venereal disease	360	203	366	209	265	367	198	330	191
Simple continued fever (*b*).	64	162	68	182	194	52	126	66	131
Respiratory diseases (*c*)	53	75	74	84	75	40	57	64	64
Diarrhœa	44	63	46	62	109	40	65	43	61
Rheumatism and neuralgia (*d*).	41	57	44	62	81	39	46	37	49
Dysentery	30	40	26	33	49	52	77	22	28
Hepatitis (*e*)	26	50	24	47	59	35	67	20	41
Enteric fever	13	5	15	5	‡	9	4	10	3
Remittent fever	10	*	10	*	*	8	*	10	*
Phthisis pulmonalis	6	8	6	8	8	5	9	6	8
Influenza	4	—	3	—	—	6	—	2	—
Spleen diseases	3	6	4	7	†7	1	2	3	6
Total from all causes	1,471	1,475	1,552	1,522	1,755	1,257	1,264	1,431	1,533
Constantly sick per 1,000 of Strength.	73	60	74	61	67	73	60	69	57

(*a*) Includes febricula up to 1885 inclusive.
(*b*) Includes other continued fevers from 1860 up to 1885 inclusive.
(*c*) Includes tonsilitis and sore throat from 1860 up to 1885 inclusive.
(*d*) Includes some allied affections from 1860 up to 1885 inclusive.
(*e*) Includes hypertrophy and simple enlargement of the liver from 1860 up to 1885 inclusive.
* Included with simple continued fever.
† From 1864.
‡ Not separated from continued and remittent fevers.

Died per 1,000 *of strength.*

DEATHS FROM	INDIA.		BENGAL.			MADRAS.		BOMBAY.	
	1881–90.	1870–79.	1881–90.	1870–79.	1860–69.	1881–90.	1870–79.	1881–90.	1870–79
Enteric fever	3·81	2·03	4·33	2·28	*	2·73	1·42	3·07	1·75
Cholera	1·46	3·22	1·48	4·18	9·24	1·05	1·68	1·87	1·53
Hepatitis	1·33	2·19	1·25	2·04	3·31	1·93	3·16	·97	1·71
Dysentery	·80	1·48	·60	1·37	* 2·72	·98	2·32	·98	·98
Phthisis pulmonalis	·74	1·18	·82	1·20	1·73	·59	1·18	·68	1·09
Respiratory diseases	·59	·97	·89	1·25	·99	·42	·32	·89	·70
Remittent fever	·52	1·28	·45	1·57	2·92	·69	·60	·60	·98
Diarrhœa	·09	·12	·07	·12	·75	·13	·04	·11	·17
Total from all causes	14·24	19·34	14·48	21·00	29·98	12·99	17·69	13·90	15·27

* Not separated from remittent and continued fevers.

The increase of the constantly-sick rate of India is probably connected with the increased prevalence of venereal diseases and ague; for both the admission and the death ratios from all causes were diminished. Owing to improvements in the grouping of diseases, made gradually in the course of the years, it is not possible in every case to show strictly the same group through two or three decennia; and in reading the tables the foot-notes must be taken into account. With regard to ague, it must be remembered that during the decennium 1881–90, large malarious territories, such as Baluchistan and Burma, were added to the Empire. As to the higher admission and death-rates from enteric fever some allowance must be made for the greater frequency with which the diagnosis "enteric fever" has been made of late years. All the other death ratios in the table were reduced, especially that from cholera. It seems that while the progress of sanitation in India has resulted in a general diminution of sickness and mortality, especially from cholera, much remains to be done in the reduction of malaria, and in the protection of the short service army from enteric fever and venereal disease.

The tables for 1882–91 for European troops will be found after the annual tables belonging to this section, and are headed Decennial 5, Decennial 18, Decennial 20, and Decennial 21. The Arabic numerals are used as a distinction from the Roman numerals of the headings of the annual tables; and, to facilitate reference, their

numbering has been arranged so that Decennial 5 is comparable with Annual V, 18 with XVIII, 20 with XX, and 21 with XXI. In the Report for 1893, Tables 5, &c., will deal with the decennium 1883–92, in the Report for 1894 with the decennium 1884–93, and so on. The decennium of Tables 5, &c., will therefore not always be so nearly identical with the census-decade as it is in the present volume. It will be observed that in these decennial tables the disease headings are not quite the same as in the corresponding annual tables. This is unavoidable, because it is only of recent years that certain of the diseases or groups of diseases now shown in the annual tables have been compiled and given separately; but arrangements have been made for the gradual assimilation of the headings in course of time. For example, pneumonia and abscess of the liver will have separate headings when 1889 becomes the first year of the decennium. In the same way stations now excluded will gradually come on the list, and stations now lumped together will be separated. Diseases that could not be shown for 10 years have been shown for six, or excluded altogether in the meantime. At the foot of Table 5 the ratios for India of some of the chief diseases have been given year by year for convenience of reference. Extracts from these decennial tables will be found in most of the minor tables throughout this section.

Bengal Army.

In the European army of Bengal sickness and mortality were increased by the prevalence of influenza and malaria. Cholera mortality, though lower than in the previous year, was still high.

European Army of Bengal.

Period	Average Annual Strength.	Ratio per 1,000 of Strength.							
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79 - -	363,433	1,522	61	4·18	16·82	21·00	41	62
1881–90* - -	38,008	1,552	74	1·48	13·00	14·48	26	40
1882–91 - - -	38,517	1,519	75	1·46	13·04	14·50	25	39
1891 - - -	40,994	1,394	80	2·78	14·08	16·86	25	42
1892 - - -	42,198	1,382	87	2·42	17·39	19·81	23	42

* Excluding troops in Afghanistan during 1881.

The chief forms of sickness were ague, venereal diseases, diseases of the integuments, injuries, and simple continued fever. Among the diseases with increased admission rates were influenza (14·8 per 1,000 against 5·8), remittent fever (15·5 per 1,000 against 7·1), enteric fever, ague, respiratory diseases, bowel complaints, and venereal diseases. On the other hand, the admission rates from alcoholism, cholera, small-pox, and nervous diseases were lessened. Ague caused 30 per cent. of the total sickness, and venereal diseases 26 per cent.

The chief causes of mortality were enteric fever, cholera, remittent fever, hepatic abscess, injuries, and heatstroke. Among the diseases with increased mortality were remittent fever (1·59 per 1,000 against 0·39), heatstroke, tubercle of the lungs, pneumonia, and hepatitis. On the other hand, mortality from cholera, small-pox, and enteric fever was lessened. Enteric fever caused 32 per cent. of the total deaths, and cholera 12 per cent.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial affections, mental diseases, tubercle of the lungs, rheumatism, hepatitis, dysentery, palpitation, valvular diseases of the heart, and injuries.

Madras Army.

Although the number constantly sick in the European Army of Madras was slightly increased, admission and mortality were substantially reduced. Cholera mortality shared in the reduction.

European Army of Madras.

Period.	Average Annual Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	11,040	1,264	60	1·68	16·01	17·69	49	67
1881–90	11,759	1,257	73	1·05	11·94	12·99	28	41
1882–91	12,052	1,270	75	1·05	12·28	13·33	28	41
1891	13,324	1,304	82	1·58	12·91	14·49	31	46
1892	13,227	1,236	83	·53	11·79	12·32	33	45

The chief forms of sickness were venereal diseases, ague, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission rates were influenza (12·3 per 1,000 against 8·0), enteric fever, remittent fever, venereal diseases and rheumatism. On the other hand, the admission rates from cholera, bowel complaints, ague, simple continued fever, heatstroke, and scurvy were lessened. Venereal diseases caused 34 per cent. of the total sickness, and ague 13 per cent.

The chief causes of mortality were enteric fever, dysentery, and hepatic abscess. Among the diseases with increased mortality were dysentery, ague, and nervous diseases. On the other hand, mortality from cholera, remittent fever, heatstroke, injuries, pneumonia, and hepatic abscess was lessened. Enteric fever caused 26 per cent. of the total deaths, dysentery 10 per cent., and hepatic abscess 8 per cent.

The chief causes of invaliding were, in order, syphilis and gonorrhœa, debility, rheumatism, dysentery, and malarial affections.

Bombay Army.

In the European Army of Bombay sickness was increased by influenza and malaria, but mortality was considerably reduced, especially cholera mortality.

European Army of Bombay.

Period.	Average Annual Strength.	Ratio per 1,000 of Strength.						
		Admissions into Hospital.	Constantly Sick.	Deaths from			Invaliding.	Total Loss.
				Cholera.	Other Causes.	Total.		
1870–79	10,359	1,533	57	1·53	13·74	15·27	43	58
1881–1890*	11,378	1,431	69	1·87	12·03	13·90	32	46
1882–91	11,660	1,394	69	2·08	11·89	13·97	30	44
1891	12,713	1,409	73	2·60	11·64	14·24	29	43
1892	12,712	1,593	74	·94	11·96	12·90	21	34

* Excluding troops in Afghanistan during 1881.

The chief forms of sickness were ague, venereal diseases, injuries, diseases of the integuments, and simple continued fever. Among the diseases with increased admission ratios were influenza (6·0 per 1,000 against 2·1), small-pox, malarial fevers, simple continued fever, pneumonia, and enteric fever. On the other hand, the admission rates from cholera, bowel complaints, hepatitis, and venereal diseases were lessened. Ague caused 33 per cent. of the total sickness, and venereal diseases 25 per cent.

The chief causes of mortality were enteric fever, cholera, injuries, and hepatic abscess. Among the diseases with increased mortality were small-pox, remittent fever, suicide, and alcoholism. On the other hand, mortality from cholera, dysentery, heatstroke, and pneumonia was lessened. Enteric fever caused 39 per cent. of the total deaths, and cholera 7 per cent.

The chief causes of invaliding were, in order, debility, syphilis and gonorrhœa, malarial affections, injuries, tubercle of the lungs, mental diseases, hepatitis, and palpitation.

The health statistics of the troops serving in Quetta were more favourable than in 1891, though the constantly sick ratio was raised.

Period.	Average Annual Strength.	Ratio per 1,000 of Strength.				
		Admissions.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1884	1,441	2,056	82	27·07	41·63	68·70
1885	1,672	2,187	94	42·46	40·67	83·13
1886	1,752	2,442	73	20·57	19·41	19·98
1887	1,932	1,374	52	1·03	10·35	11·38
1888	2,223	1,140	59	—	13·50	13·50
1889	2,210	1,152	58	0·90	9·05	9·95
1890	2,019	1,099	58	—	9·41	9·41
1891*	2,162	1,622	62	6·48	7·40	13·88
1982*	2,213	1,522	72	—	9·94	9·44

* Excluding troops on the march.

There was increased prevalence of influenza and enteric fever and increased mortality from enteric fever.

The statistics of Gnathong were better in 1892 than in the other two years of its occupation.

Period.	Average Annual Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1890	78	1,782	64	—	38·46	38·46
1891	104	1,192	58	—	9·62	9·62
1892	112	1,027	45	—	—	—

There was an increase of dysentery, but no deaths from any cause.

The vital statistics of the troops serving in Burma were, as shown in the following table, better in 1892 than in 1891, and there was no cholera.

European Troops in Burma.

Period.	Average Annual Strength.	Ratio per 1,000 of Strength.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	Other Causes.	Total.
1889	4,825	1,903	92	2·49	26·73	29·22
1890	4,712	1,743	102	—	20·80	20·80
1891	4,623	1,589	92	2·38	17·74	20·12
1892	4,316	1,491	91	—	14·83	14·83

Burma was distinguished by the prevalence of dysentery and hepatitis. In 1892 it was free from influenza.

Some of the more important causes of admission into hospital in the there Presidencies are shown in the following table in the direct order of their decennial ratios:—

Admitted per 1,000 *of strength.*

Admissions from	Bengal. 1892.	Bengal. 1891.	Bengal. 1882 to 1891.	Admissions from	Madras. 1892.	Madras. 1891.	Madras. 1882 to 1891.	Admissions from	Bombay. 1892.	Bombay. 1891.	Bombay. 1882 to 1891.
Venereal diseases	412	395	377	Venereal diseases	415	402	380	Venereal diseases	396	417	354
Ague	482	369	362*	Ague	166	249	238*	Ague	527	360	322*
Simple continued fever	55	40	72*	Dysentery	45	48	53	Simple continued fever	86	60	79*
Diarrhœa	36	35	44	Simple continued fever	62	70	73*	Diarrhœa	37	39	42
Dysentery	25	23	25	Diarrhœa	8	13	37	Dysentery	19	25	22
Respiratory diseases	40	37	38*	Hepatitis	28	26	34	Hepatitis	16	17	19
Rheumatism and neuralgia.	31	36	29*	Rheumatism and neuralgia.	40	37	37*	Rheumatism and neuralgia.	26	28	31*
Hepatitis	18	18	23	Respiratory diseases	30	28	26*	Respiratory diseases	27	30	28*
Enteric fever	27	25	17	Enteric fever	12	11	10	Enteric fever	18	16	11
Remittent fever	16	7	9	Remittent fever	11	8	8	Remittent fever	7	5	8
Phthisis pulmonalis	4	4	5	Influenza	12	8	7	Phthisis pulmonalis	5	5	6
Influenza	15	6	4	Phthisis pulmonalis	2	3	4	Spleen diseases	2	2	3
Spleen diseases	3	3	4	Spleen diseases	—	1	1	Influenza	6	2	2
TOTAL FROM ALL CAUSES	1,582	1,394	1,519	TOTAL FROM ALL CAUSES	1,236	1,304	1,270	TOTAL FROM ALL CAUSES	1,593	1,469	1,399

* For six years, 1886-91.

In all three Presidencies venereal diseases and ague head the list. For the decennium venereal diseases stand first in all three Presidencies, but in 1892 ague was highest in Bengal and Bombay. Ague in Madras was lower than in the decennium, but in Bengal and Bombay it was higher; and in all venereal disease was higher than it was for the decennium. Bengal had the highest admission ratios from respiratory diseases, enteric fever, remittent fever, influenza, and spleen diseases; Madras the highest from venereal diseases, hepatitis, rheumatism, and dysentery; Bombay the highest from ague, simple continued fever, diarrhœa, and phthisis pulmonalis.

Some of the more important causes of death in the three Presidencies are shown in the following table:—

Deaths from the Chief Diseases and from all Causes in the three Presidencies per 1,000 *of strength.*

Deaths from	Bengal. 1892.	Bengal. 1891.	Bengal. 1882-91.	Deaths from	Madras. 1892.	Madras. 1891.	Madras. 1882-91.	Deaths from	Bombay. 1892.	Bombay. 1891.	Bombay. 1882-91.
Enteric fever	6·40	6·64	4·73	Enteric fever	3·18	3·08	2·95	Enteric fever	5·03	5·58	3·36
Cholera	2·42	2·78	1·46	Hepatic: Abscess	·98	1·35	1·92	Cholera	·94	2·60	2·08
Hepatic: Abscess	1·28	·98	1·19	Hepatic: Congestion and inflammation	·15	·23		Hepatic: Abscess	·63	·55	·89
Hepatic: Congestion and inflammation	·07	·05		Cholera	·53	1·58	1·05	Hepatic: Congestion and inflammation	·08	·16	
Phthisis pulmonalis	·75	·61	·79	Dysentery	1·29	·45	·90	Dysentery	·08	·47	·86
Pneumonia	·81	·51	·87*	Remittent fever	·38	·83	·76	Phthisis pulmonalis	·55	·63	·69
Other respiratory diseases	·17	·10		Phthisis pulmonalis	·60	·30	·54	Remittent fever	·24	·98	·51
Dysentery	·59	·44	·55	Pneumonia	·30	·68	·57*	Pneumonia	·31	·47	·55*
Remittent fever	1·59	·39	·43	Other respiratory diseases	·08	·08		Other respiratory diseases	·16	·08	
Diarrhœa	·09	·07	·04	Diarrhœa	—	—	·11	Diarrhœa	·16	·16	·09
TOTAL FROM ALL CAUSES	19·81	16·86	14·50	TOTAL FROM ALL CAUSES	12·32	14·49	13·33	TOTAL FROM ALL CAUSES	12·90	14·24	13·97

* For six years, 1886-91.

In all three Presidencies enteric fever heads the decennial list, followed in Bengal and Bombay by cholera and hepatitis, and in Madras by hepatitis and cholera. But in 1892 remittent fever occupied the third place in Bengal, and dysentery the second

place in Madras. Enteric fever increased in all three Presidencies; cholera and hepatitis only in Bengal.

Bengal had the highest death-rates from enteric fever, cholera, hepatic abscess, phthisis, pneumonia, other respiratory diseases, and remittent fever; Madras the highest from dysentery; Bombay the highest from diarrhœa. The percentage respectively of enteric fever, hepatitis, dysentery and pneumonia in the total deaths of each Presidency was :—

1892.

	Madras.	Bombay.	Bengal.
Enteric fever	32·3	25·8	39·0
Hepatitis	6·9	9·2	5·5
Dysentery	3·0	10·4	0·6
Pneumonia	4·1	2·5	2·4

Bengal was highest in pneumonia, Madras in dysentery and hepatitis, and Bombay in enteric fever.

Sickness in the Geographical Groups.—The following table shows that, judging by the constantly-sick rate. Groups II., XII*b*. and V. were the most unhealthy for the decennium, and XII*a*. the most healthy. It also shows that the 1892 constantly-sick rate of every group, except XII*b*., was higher than its corresponding decennial ratio, and that the rise was greatest in the case of Group V.

		Ratio per 1,000 of Strength.												
		I.	II.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII*a*.	XII*b*.	
		Burma Coast and Bay Islands.	Burma Inland.	Bengal and Orissa.	Gangetic Plain and Chutia Nagpur.	Upper Sub-Himalayan.	Indus Valley and North-Western Rajputana.	South-Eastern Rajputana, Central India, and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	Hill Convalescent Depôts.	India.
1882-91	Constantly sick	74·6	91·4	82·8	83·0	81·6	79·4	78·8	69·8	72·0	75·7	65·1	90·6	74·0
	Death—Cholera	·35	2·24	1·10	3·45	1·04	·85	2·19	·85	—	·38	1·51	·94	1·49
	Death—Enteric fever	2·37	2·31	2·09	5·87	5·33	3·69	5·66	3·71	1·71	2·66	4·44	3·67	4·13
1891	Constantly sick	83·7	100·0	99·7	98·7	86·7	70·8	78·2	75·7	85·9	87·5	65·8	81·9	79·1
	Death—Cholera	—	·74	·45	9·68	1·26	3·03	3·92	1·69	—	·28	1·65	—	2·51
	Death—Enteric Fever	3·08	4·43	4·98	6·55	8·73	4·11	6·99	4·43	—	4·19	5·84	8·93	5·73
1892	Constantly sick	92·6	91·7	97·6	104·7	88·5	89·0	91·0	72·3	85·3	86·8	66·8	84·0	83·6
	Death—Cholera	—	—	—	1·50	3·52	3·88	·66	·62	—	1·72	·33	2·27	1·78
	Death—Enteric fever	·62	2·85	1·32	5·45	7·41	5·43	6·62	5·72	2·17	2·86	6·31	9·08	5·52

Of the 12 annual ratios of constantly sick, ten were higher than the ratio of India, and two lower, the highest being that of the Gangetic Plain, and the lowest that of the Hills. The highest admission ratio was that of the Indus Valley, and the lowest that of the Hills. Burma Coast had the highest admission ratios from dysentery, hepatitis, and rheumatism, and the lowest from enteric fever; Burma Inland the lowest from respiratory diseases; Bengal-Orissa the lowest from tubercle of the lungs; the Gangetic Plain the highest from venereal diseases and diseases of the integuments; the Indus Valley the highest from ague, cholera, remittent fever, heat-stroke pneumonia, scurvy, and eye diseases, and the lowest from hepatitis, rheumatism, and venereal diseases; Central India the highest from influenza, small-pox and diarrhœa; Western Coast the highest from simple continued fever, and respiratory diseases other than pneumonia, and the lowest from remittent fever, dysentery, and hepatic abscess; the Hills the highest from enteric fever and tonsilitis.

Referring to the table just given, it will be seen that decennial cholera mortality was highest in Groups V., II., and VIII., and lowest in X. and I.; that for at least 11 years there has been no cholera among the European troops in Group X., Western Coast; and that in 1892 the cholera mortality of Groups VI., VII., XI., and XII *b*.

rose higher than the decennial ratios. It will also be seen that enteric fever mortality was highest in Groups V., VIII., VI., and lowest in X. and IV.; and that in 1892 the enteric fever mortality of all the Groups, except I., IV., and V., was higher than the decennial ratio. Of the 12 annual ratios, four were higher and eight lower than the ratio of India; that of the Indus Valley being highest, and that of Burma Coast lowest. Burma Coast had the highest death-rate from dysentery, and the lowest from enteric fever; the Indus Valley the highest from cholera, remittent fever, heat-stroke, pneumonia, other respiratory diseases and diarrhœa, and the lowest from hepatic abscess; Western Coast the highest from tubercle of the lungs and suicide; the Hill Convalescent Depôts the highest from enteric fever and abscess of the liver, Upper Sub-Himalayan coming next to them in the former disease, and Burma Coast in the latter.

The following table shows how the composition of 100 deaths varied in the groups in 1892:

Percentage in Total Deaths.

Deaths from	1. Burma Coast and Bay Islands.	2. Burma Inland.	3. Bengal and Orissa.	4. Gangetic Plain and Chutia Nagpur.	5. Upper Sub-Himalayan.	6. Indus Valley and North-West Rajputana.	7. South-East Rajputana, Central India, and Gujarat.	8. Deccan.	9. Western Coast.	10. Southern India.	11. Hill Stations.	12. Hill Convalescent Depôts.
Cholera	—	—	—	8·8	16·0	12·2	4·5	5·4	—	16·7	2·5	10·0
Enteric fever	8·3	15·2	11·5	32·0	33·7	17·1	44·9	49·1	18·8	27·8	49·2	40·0
Remittent fever	—	8·7	15·4	·8	1·7	32·9	2·2	·9	—	—	1·7	3·3
Dysentery	25·0	8·7	7·7	4·8	2·0	3·7	2·2	5·4	—	2·8	·8	6·7
Diarrhœa	—	—	—	—	-	1·2	2·2	—	—	—	1·7	—
Abscess of liver	33·3	4·3	15·4	13·6	4·3	1·2	7·9	3·6	6·2	13·9	5·1	11·7
Pneumonia	—	—	—	2·4	4·7	4·9	3·4	1·8	6·2	—	6·8	3·3
Tubercle of the lungs	—	2·2	7·7	1·6	3·7	2·4	2·2	5·4	12·5	2·8	5·1	3·3
Total from all Causes	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

It shows that, viewed in proportion to the total deaths from all causes, dysentery and hepatic abscess formed more important items in Group I. than in other groups; cholera in Southern India and Upper Sub-Himalayan; enteric fever in the Hills and the Deccan; remittent fever in the Indus Valley (Peshawar outbreak); pneumonia in the Hills and Western Coast; and tubercle of the lungs in Western Coast.

Of the large garrisons with a strength of over 1,000, the following returned death-rates higher than the death-rate of the Presidencies:—

Stations.	Average Annual Strength in 1892.	Ratio per 1,000 of Strength.		Chief Causes of Mortality per 1,000 in 1892.								Total Number of Deaths in 1892.
		1892.	1891.	Cholera.	Enteric Fever.	Remittent Fever.	Dysentery.	Diarrhœa.	Abscess of Liver.	Pneumonia.	Tubercle of the Lungs.	
Bareilly	1,127	28·39	22·12	—	16·86	—	—	—	2·66	·89	—	32
Meean Meear	1,020	38·24	9·99	16·67	5·88	·98	—	—	2·94	1·96	·98	39
Peshawar	1,639	56·74	20·76	7·93	5·49	32·95	2·44	—	—	1·83	—	93
Kurrachee	1,055	18·96	3·65	2·84	3·79	—	—	·95	—	·95	1·90	20
Poona	1,970	13·71	15·27	—	9·14	—	—	—	·51	—	—	27
Secunderabad, South	1,727	13·32	13·44	—	7·53	—	1·74	—	—	·58	1·16	23

Peshawar suffered from influenza, cholera, dengue, and a severe outbreak of malaria. For a short description of this malarial outbreak, see page 52.

According to the following table, issued by the Quartermaster-General in India, 14,219 men of the Bengal Army, or 32·79 per cent. of strength, were located in

the Hills on the 1st June 1892, but Quetta and Gnathong are not included in this table:—

Statement showing the Number of European Troops, &c. located in the Hills on 1st June 1892.‡

Name of Accommodation.	Men.	Women.	Children.
Hill Depôts - - -	2,446	214	507
Regular Hill Stations - -	4,795	203	353
Temporary Locations - -	6,958	194	404
Mussoorie Summer Home -	—	—	58
Total - -	14,219*	607	1,322
Percentage to Total Strength -	32·79†	40·01†	47·23†

* As on 1st June.
† Excluding 28 men, 32 women, and 86 children of the unattached list.
‡ Excluding Gnathong and Quetta.

Principal diseases: Influenza.

In December 1891 influenza began to rise again, attained a maximum in March 1892, and ceased in the following August. Influenza rose from 372 cases, 5·5 per 1,000 of strength in 1891, to 862 cases, 12·7 per 1,000 of strength. Geographical Groups VI., VII., X., IX., and XII. were attacked in both years; II., IV., and X. only in 1891; and V., VIII., and XI. only in 1892. Thirty-eight stations were attacked in 1892, against 20, and of the 38, 30 had not been attacked in the preceding year, so far at least as the European troops were concerned. The maximum of 1892 was reached in March, whereas that of 1891 was in July. The greatest number of cases occurred at Agra, Peshawar, Quetta, and Secunderabad, places widely separated from each other. In Quetta there were two outbreaks in the year, whilst the other three stations had single compact outbreaks. The returns deal, of course, only with those cases which were admitted into hospital; but medical officers state that there were many mild cases not admitted. Doubtless also in India, where fever and dysentery are so common, the diagnosis was sometimes difficult. The lowering effect of influenza, however mild, on the general standard of health was also noted. It seems certain that the minute fine bacillus discovered by Pfeiffer is peculiar to the disease. It occurs in vast numbers in the secretions of the air passages of those affected. It remains alive for about 14 days in moist sputum, but has no spores and is easily deprived of life by drying. There seems, therefore, little danger of the conveyance of the bacillus by letters, clothing, &c., but great danger of infection through the catarrhal secretions of influenza patients. Of the lower animals experimented on (horses were not included), only monkeys proved suspectible of taking the disease.

Cholera.

The amount of cholera was less than in the preceding year. There were 167 admissions against 252, and 121 deaths against 168. The permillage of admissions to strength was 2·5, and of deaths to strength 1·78, and the percentage of deaths to cases 71·0. The corresponding figures of 1891 were 3·8, 2·50, and 66·67, and of the decennium 1881–90 2·1, 1·46 and 68·11. The months most affected were April, June, August, September, and October; the greatest number of cases occurred in August and September; and there was more cholera in the second half of the year than in the first.

The ratios of morbidity, mortality, and fatality from cholera in the Bengal army were respectively, 3·4, 2·42, and 69·66, against 4·1, 2·78, and 67·06 in 1891, and against 2·2, 1·48, and 67·59 in the decennium 1881–90. Of the total 143 cases 56 per cent. occurred in August-October, and 36 per cent. in April-June. The stations most severely affected were Ferozepore with 27 cases and 18 deaths, Meean Meer with 26 cases and 17 deaths, and Peshawar with 21 cases and 13 deaths.

In the Madras army there were eight cases of cholera, a ratio of 0·6, against 2·2, and 7 deaths, a ratio of 0·53 against 1·58. The fatality was 87·50 against 72·41 in 1891, and 70·69 in the decennium 1881–90. There were five cases in August, of which Bellary had four.

The morbidity ratio of the Bombay army fell from 4·2 to 1·3, the mortality ratio from 2·60 to 0·94; while the fatality ratio was 75·00 against 62·26 in 1891, and 68·05 in the decennium 1881–90. Out of the 16 cases 50 per cent. occurred in August at Kirkee, Kurrachee, and Hyderabad.

It has already been mentioned that among the geographical groups the Indus Valley had the highest ratio. Next came the Upper Sub-Himalayan and the Hill Depôt groups. There was no cholera in Burma Coast, Bengal-Orissa and Western Coast. The table on page 49 shows that for 1882–91 Gangetic Plain, Burma Inland, and Central India had high cholera mortalities; Burma Coast and Southern India low cholera mortalities; and that Western Coast has had no cholera at all for at least 11 years.

Small-pox.

Small-pox was somewhat more prevalent. There were 18 admissions (0·3 per 1,000) and three deaths (0·04 per 1,000) against 14 (0·2 per 1,000) and one (0·01 per 1,000) in 1891. The increase was mostly in Bombay. The greatest number of cases at any one station was 3 at Mhow, and one death each occurred at Neemuch, Mhow, and South Bangalore.

Fevers.

Ague gave rise to about 28 per cent. of the admissions from all causes in the Army of India. The admission rate (429·1) was nearly 86 per 1,000 higher than in the preceding year. The rise of admission was in Bengal and Bombay, especially the latter, but mortality rose in all three Presidencies. The most malarious groups in 1892 were Indus Valley, Central India, and Upper Sub-Himalayan, and the least malarious Southern India and Burma Coast.

The admission and death ratios from remittent fever rose respectively from 6·8 and 0·42 to 13·1 and 1·10. All the Presidencies, but especially Bengal, participated in the increase of admission. Mortality in Bengal was much increased, in Bombay increased, and in Madras much decreased. The highest ratio was that of Indus Valley group, and the lowest that of Western Coast group. There was a great outbreak of malaria at Peshawar, of which the following is a short account by the medical officer in charge, Brigade-Surgeon Lieutenant-Colonel Brown:

The malarial fever was of a specially severe type, and prevailed mostly during the months of September, October, November, and December. In this period there were 54 deaths from remittent fever, and in the early cases it was extremely difficult to diagnose them from cholera; the patient being attacked with purging, vomiting, cramps, suppression of urine, quickly followed by collapse. At the *post-mortem* examinations the liver and spleen were found greatly congested, the latter organ weighing in some cases from 30 to 40 ounces. . . . . The cause of this unusual sickness was generally attributed to the heavy rainfall in the months of July and August. Seventeen inches of rain were recorded during these two months, or more than the whole yearly average, and of this the greater part fell in the early part of August. There is no record of a similar rainfall in the Peshawar Valley for these two months.

For India the admission rate from simple continued fever rose from 49·8 to 61·9, while there were three deaths against one. Each Presidency returned one death, and all had increased admission rates. The Western Coast group had the highest ratio, and Bengal-Orissa the lowest. Medical officers frequently note that many of the cases returned as simple continued fever are in all probability really mild cases of enteric fever with symptoms too indefinite to justify a diagnosis of the more serious malady. Medical officers differ in practice as to where they draw the line between simple continued fever and enteric fever.

Enteric fever.

The experimental results of Sanarelli and of Chantemesse and Widal, reported in the *Annales de l'Institut Pasteur* (25th November 1892), are of practical importance. These observers, although they found, in opposition to the Lyons school, that the *bacillus coli communis* preserved its identity under all circumstances, and did not tend to merge into the typhoid bacillus, discovered nevertheless that the *bacillus coli* was capable of exercising an important influence on the origin and on the progress of enteric fever. As long as the intestinal canal is in a healthy condition, the *bacillus coli* is harmless, and is non-pathogenic for animals; but there are numerous observations from all parts of the world to show that when the resisting power of the intestinal wall is lowered, and multiplication of the microbe is favoured by circumstances, the *bacillus coli* is capable of setting up pathological processes of all degrees of severity both within and beyond the intestinal canal, and becomes pathogenic for animals. But the important observation of the above experimenters is that the soluble products of *bacillus coli*, as well as of the *proteus vulgaris*, the *streptococcus*, *etc.*, bring about both in the intestine and in the body a state of matters very favourable to the virulent action of the typhoid bacillus; so that abnormal activity of the *bacillus coli* may, on the one hand, determine that a patient shall have an attack of enteric fever, if the typhoid bacillus enter his body at that moment, or is already there; or, on the other hand, may bring about a relapse in

a case in which the tissues of the body had almost gained the victory over the typhoid bacillus. It is also known that in the course of enteric fever the *bacillus coli* multiplies greatly in the intestine. Of special interest it is to Indian medical officers that Sanarelli found that long exposure to humid heat produces functional disorders of the abdominal organs, and especially of the intestinal canal, and favours a certain degree of self-poisoning, that renders the animals more sensitive to certain infections. He found that animals which had been so exposed rapidly succumbed to attenuated virus; whereas the same attenuated virus had no effect on the control animals which had not been so exposed. He considers that this self-poisoning and increased susceptibility are partly caused, not only by the check to radiation and the want of oxygenation, but also by the enormous multiplication of the *bacillus coli*, which, if the exposure continues, is capable of invading the whole body, and producing therein a true, specific, general infection of its own. It would be interesting to know the results of experiments with dry heat. One of the practical applications of these observations is the importance of personal hygiene, as well as of general measures of sanitation, the necessity, besides placing the young newly-arrived soldier in clean surroundings, of taking care that his intestinal canal is not allowed to fall into an abnormal condition; so that if Eberth's bacillus does gain an entrance into his intestinal canal it shall meet with no encouragement there. Initial constipation in the enteric and other fevers of India is common. Here attention may be drawn to an article on "Entero-Septic Fevers" by Surgeon-Captain Ross in the *Indian Medical Gazette* of August 1892. Another interesting result, attained by the French observers, was that no matter how the bacillus was introduced into the body of the animals experimented on, the small intestine was always affected. This shows that the constant affection of the ileum in man is no *proof* that he always takes the bacillus in by his mouth, though other circumstances render that probable. In the investigation of outbreaks the possibility of other modes of ingress should, therefore, not be lost sight of. Again, Chantemesse and Widal, noticing that anything that enfeebles the individual, whether by self-poisoning or by poisoning from without (under which heads might, no doubt, be included fatigue, chill, exposure, dietetic errors, &c.,) favours the invasion of the typhoid bacillus, go on to say that the action of impure water in causing the appearance of enteric fever is probably similar: it disorders the bowels, lowers the resisting power of the economy, and favours the multiplication of the intestinal microbes, rendering the body an easier prey to any typhoid bacilli that may find an entrance. At any rate, observers of different nationalities are agreed that the presence of the *bacillus coli* in water, even though the typhoid baccillus itself may not be found, is sufficient to condemn the water; because it suggests fæcal contamination, and therefore risk of typhoid-stool contamination. This is all the more fortunate as experience has more and more shown that the identification of the typhoid bacillus in water is a matter of the utmost difficulty and delicacy, only to be undertaken by a thoroughly qualified expert in a laboratory. A whole series of morphological, biological, and chemical tests have to be carried out before a conclusion of any certainty can be arrived at; and reports of the finding of the bacillus in water, made in former times of less knowledge, are now looked upon with doubt. The practical conclusion of the whole matter is an old one, that to protect the men of the Army of India from enteric fever it is necessary to have soldiers clean and well cared for in every respect, internally as well as externally, placed in clean surroundings, and to extend the area of cleanliness far beyond cantonment limits, in fact ultimately throughout the length and breadth of India. It is a good thing to secure the cleanliness of the immediate invironment of the troops, but they will never be safe as long as the native population and its towns and villages are left uncleansed to act as a reservoir of dirt and disease.

With regard to the question of the identification of Indian fevers, the researches of Surgeon-Captains Bruce and Hughes on "Malta Fever" are of great interest (*Practitioner*, September, 1887; *Lancet*, 3rd December 1892; *Annales de l'Institut Pasteur*, 25th April 1893, and 25th August 1893). This is a form of fever common on the shores of the Mediterranean, having resemblances both to enteric fever and to malarial fever, but distinct from both, due to a specific micrococcus, and supposed to be connected with fæcal insanitation. In this connexion the following remarks of the medical officers of Wellington Depôt are suggestive:—

The outbreak of simple contiuued fever occurred shortly after the arrival of the Royal Scots from Malta . . . . As the Royal Scots show a greater number of admissions, viz., 61 per cent. of the whole, it is probable that climate, age, and immediate previous service in Malta are important elements in its causation. Six only out of 40 admissions occurred among men who joined direct from England.

Lastly, if it be true, as has been reported, that cholera baciili have been found in the stools of people living in the midst of cholera, but not themselves affected, or only slightly so, and if, in the same way, the typhoid bacillus can also pass through the healthy or comparatively healthy body, one explanation is suggested why the origin of cases is sometimes mysterious.

There was an increase of morbidity, but a decrease of mortality from enteric fever in 1892. As compared with the corresponding ratios of 1881, the admission (22·1) and death (5·52) ratios for enteric fever respectively rose by 1·7 and fell by 0·21 per 1,000 of strength. There were 1,509 admissions and 376 deaths in 1892, against 1,366 and 384 in 1891.

The following table shows the admission and death-rates from enteric, and from intermittent, remittent, and simple continued fevers for two decennia, and for the last two years :—

Period.	Bengal.						Madras.						Bombay.					
	Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.			Admissions per 1,000.			Deaths per 1,000.		
	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.	Enteric fever.	Ague, remittent, and simple continued fevers.	Total.
1870-79* - -	5·3	607·3	612·6	2·28	1·74	4·02	3·9	266·5	270·4	1·42	0·62	2·04	3·1	659·9	663·0	1·75	1·14	2·89
1881-90† -	15·2	536·0	551·2	4·33	0·59	4·92	9·0	254·6	263·6	2·73	0·91	3·64	10·0	486·6	496·6	3·07	0·85	3·92
1891 - -	24·9	416·3	441·2	6·64	0·56	7·20	10·8	327·3	338·1	3·08	1·21	4·29	15·7	424·8	440·5	5·58	0·16	5·74
1892 - - -	20·8	552·1	578·9	6·40	1·85	8·25	11·9	239·7	351·6	3·18	1·06	4·24	17·5	620·0	637·5	5·03	0·40	5·43

* Including troops on active service and on the march. † Excluding Bengal and Bombay troops in Afghanistan during 1881.

The table shows the increase in the diagnosis of enteric fever; but also, especially by the rising mortality, a real increase of enteric fever. The following table contains mortalities only :—

	During 1870-79.			During 1881-90.			During 1891.			During 1892.		
	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.	Enteric Fever.	Other Fevers.*	Total of both.
Army of India† -	2·03	1·42	3·45	3·79	0·70	4.49	5·73	0·61	6·34	5·52	1·42	6·94
„ Bengal‡ - -	2·28	1·74	4·02	4·33	0.59	4·92	6·64	0·56	7·20	6·40	1·85	8·25
„ Madras† - -	1·42	0·62	2·04	2·73	0·91	3·64	3·08	1·21	4·29	3·18	1·06	4·24
„ Bombay‡	1·75	1·14	2·89	3·07	0·85	3·92	5·58	0·16	5·74	5·03	·40	5·43

* Intermittent, remittent, and simple continued fevers.

† Excluding troops on active service in Burma during 1885 to 1887.

‡ Excluding troops in Afghanistan during 1881.

It shows that in the last ten years, and especially of recent years, there has been an increase in total fever mortality, usually ascribed to the greater youthfulness and recent arrival of the soldiers of to-day; and an increase of mortality from enteric fever, accompanied by a decrease in mortality from the other fevers, which is probably partly due to increased susceptibility on the part of the army, from youth and recent arrival, and partly due to the greater frequency with which the diagnosis of enteric fever is now made.

The following table shows enteric fever in the geographical groups in the decennium 1882–91, and in the last two years :—

	I.		II.		IV.		V.		VI.		VII.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1882–91	4·1	2·37	4·7	2·31	5·4	2·09	24·3	5·87	18·6	5·33	12·5	3·69
1891	3·7	3·08	8·5	4·43	10·9	4·98	31·3	6·55	31·1	8·73	12·1	4·11
1892	3·7	·62	7·3	2·85	5·7	1·32	24·1	5·45	26·5	7·41	17·1	5·43
Percentage of deaths to cases in 1892	16·67		36·84		21·43		18·26		22·80		30·43	

	VIII.		IX.		X.		XI.		XII*a*.		XII*b*.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1882–91	17·4	5·66	12·0	3·71	4·5	1·71	10·9	2·66	18·4	4·44	10·7	3·67
1891	25·9	6·99	13·3	4·43	2·3	—	19·6	4·19	21·3	5·84	16·3	8·93
1892	20·3	6·62	22·7	5·72	5·1	2·17	14·9	2·86	36·0	6·31	22·3	9·08
Percentage of deaths to cases in 1892	28·99		23·81		37·50		15·38		17·42		40·00	

In the decennium Groups V., VI., and XII*a*. had high admission and death-rates, and Groups I., II., IV., and X. low rates. In the year 1892 also the same groups had high and low rates. All the groups except I. and V. had increased admission and death-rates in 1892, and the reduction in the admission-rate in Group V. was very small.

The following table shows those garrisons of India which had an average strength of over 1,000 in 1892, with their decennial ratios from enteric fever for reference :—

ENTERIC FEVER IN THE DECENNIUM 1882–91 AND IN 1892.

Stations over 1,000 *strong.*

Stations.	Decennium 1882–91.		Admission-rate per 1,000 of Strength in 1892.	Death-rate per 1,000 of Strength in 1892.	Died out of each 100 Cases treated in 1892.
	Admission-rate.	Death-rate.			
Bareilly	34·2	8·67	44·4	16·86	28·79
Lucknow	32·7	5·62	29·6	6·45	16·67
Sialkot	32·1	8·13	52·4	9·87	16·25
Kurrachee	22·4	4·00	23·7	3·79	16·00
Rawalpindi	19·9	5·34	26·8	8·69	27·91
Secunderabad	19·4	5·40	23·5	5·33	21·74
Mhow	19·2	5·31	13·9	1·89	12·50
Meean Meer	19·0	5·75	14·7	5·88	37·50
Bangalore	18·1	3·66	17·0	2·06	9·30
Meerut	15·9	4·93	23·0	6·18	19·64
Quetta	14·0	3·67	30·7	3·62	11·76
Agra	13·9	4·46	15·5	6·01	38·89
Umballa	10·6	2·49	21·9	4·69	18·00
Poona	10·5	3·58	31·0	9·14	26·87
Peshawar	10·4	4·33	11·0	5·49	47·37
Colaba (Bombay)	4·6	1·59	4·9	1·95	40·00
Fort William	3·7	2·21	2·7	—	—
Belgaum	2·9	1·19	1·8	·90	50·00

The high position occupied by the decennial ratios of Bareilly, Lucknow, and Sialkot will be observed; and the low position of the ratio of Fort William. Among the decennial death-rates, those of Bareilly and Sialkot were highest. In 1892, Bareilly and Sialkot had the highest admission and death-rates, and Belgaum and Fort

William the lowest. Nineteen stations had no enteric fever. Of these, Port Blair, Satara, Sitabildi, Butcher's Island, Pallavaram, Gnathong, Kuldunnah, Ramandroog, and Khandalla had also had no enteric fever in 1891; and of these again, Satara, Pallavaram, Gnathong, Kuldunnah, Ramandroog, and Khandalla had also had none in 1890.

The following table shows the greater liability of the young soldier to die from enteric fever, and the decreasing liability with advancing age :—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Ages, together with the Ratios of Liability to it.

Year.	Mortality from Enteric Fever and Ratio of Liability to it at Different Ages.					
	24 and under.		25 to 29.		30 to 34.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	9·81	64·50	3·25	21·37	1·83	12·03
1890	7·78	65·93	2·84	24·07	1·18	10·00
1891	9·11	68·65	2·97	22·38	·71	5·35
1892	8·44	64·87	2·92	22·44	1·65	12·68

Again, the following shows that the recently arrived soldier is more apt to die from enteric fever than he who has been longer in the country, and that with increased length of service in India, the liability to death from enteric fever rapidly diminishes :—

Statement showing the Death Ratios of the European Army from Enteric Fever at different Periods of Residence in India, together with the Ratios of Liability to it.

Year.	Mortality from Enteric Fever, and the Ratio of Liability to it at Different Periods of Residence in India.					
	1st and 2nd Years.		3rd to 5th Year.		6th to 10th Year.	
	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.	Deaths per 1,000.	Percentage of liability.
1889	11·65	57·02	4·20	20·56	2·43	11·89
1890	10·21	66·47	2·98	19·40	2·17	14·13
1891	11·60	64·19	3·64	10·14	2·23	2·34
1892	10·69	65·99	3·56	20·74	2·15	13·27

As in former years, the medical officers were usually unable, even to their own satisfaction, to trace out in any given outbreak a definite insanitary condition to which the outbreak might with certainty be attributed. Most medical officers lay stress on the influence of climate acting on young and unseasoned soldiers; some noting that increase of disease in a station is connected with the arrival of drafts from the old country, and that these bodies of men afterwards gradually become "acclimatised." In certain cases, from what is known of the period of incubation of enteric fever, it was believed that these drafts had imbibed the active cause of the disease on their way inland from the port of landing. Most medical officers suspect strongly the bazaar supplies, especially the bazaar drinks, obtained privately by the men; and also impure water drunk casually by the men out walking or on the march. In the case of a body of men marching up to Dalhousie the medical officer saw a man drink from a dirty puddle on the roadside, and the attack of enteric fever which this man afterwards underwent was thought to be connected therewith. Many of the cases of enteric fever treated in the hill-stations were apparently contracted on the march up from insanitary conditions encountered *en route*. In several cases chill or exposure to the sun, especially if combined with fatigue, as is apt to be the case at rifle ranges and camps of exercise, is mentioned as at least a pre-disposing cause; and it is the opinion of one medical officer that the so-called enteric fever of India is nothing but a more severe development of the simple continued fever which is apt to follow such exposures. The medical officer at Sialkot considers that there is surface and sub-soil pollution favouring the presence of the disease, the seasonal activity of which is regulated by meteorological conditions. In some cases the state of the conservancy was found fault with, but no definite connexion was

established between the defect and the occurrence of the fever. The possibility of the causative activity of infective dust is *directly* noticed by only a few medical officers. At Quetta it was pointed out that the night-soil trenches are to the west of the cantonment, and that the frequent dust-storms come from the same direction. Here it may be noted that in the *Zeitschrift für Hygiene* of 12th May 1893, Professor Pfuhl describes how in the investigation of an epidemic in a certain circumscribed community he was led to conclude that the second case of the series was due to wind-borne sand infection. But it is only recently-infected dust that can be active, because it has been found that the typhoid bacillus in dejecta or other media, when exposed on the *surface* of the ground to the full force of meteorological influences, soon dies. The filter in one of the barracks at Pachmarhi from which cases were admitted was found in a foul condition. In the case of Kasauli, Poona, Kirkee, and Pachmarhi, the water-supply was considered to be more or less open to the suspicion of probability of contamination. On the whole, great care seems to have been exercised in supervising the milk-supply, though the difficulties, one of which is the indifference of the men themselves, were great. At Campbellpur, Bhagsu, and Quetta the connexion of cases with dirty milk was suspected or asserted, but there was no complete proof thereof. As a rule, cases seemed to come from the various barracks of a station without preference; and where there seemed to be a preference for a particular room or barrack, the cause of the preference was not discovered, unless, possibly, in the dirty filter at Pachmarhi and in the greater height of the ground-water at the cavalry barracks of Sialkot. Out of the 1,509 cases of enteric fever which occurred throughout the army of India in 1892, about 34 declared themselves among men already in hospital, either as patients or as attendants, or in men who had just left hospital; out of these, 15 were in hospital for venereal diseases, 8 were in hospital for other diseases, and 11 were orderlies in attendance on enteric fever cases. The suspicion in these last cases was that from want of observing the proper precautions of cleanliness they got the disease from the sick through the medium of their excretions. At Dagshai a sweeper who removed the excreta from the enteric ward is said to have died from enteric fever. It must be remembered that the station in which a case is admitted is not always the station in which the disease was contracted; for medical officers frequently noted, especially in the case of the hill stations, that the disease must have been contracted before arrival, either from impurities encountered on the march, or from a cause existing in the previous station. Delhi, Mallapuram, Rangoon, Aden, and Satara are said to be stations where enteric fever is rare, and the medical officer of Satara considers this an argument against the climatic origin of Indian enteric fever. Muttra is said to have escaped on account of its good sanitation; Attock because its night-soil trenches are 2 miles away from the barracks. A diminution of enteric fever at Roorkee and at Nasirabad was thought to be connected with the bazaars having been placed out of bounds on account of the prevalence of cholera and small-pox. The medical officer at Allahabad draws attention to a form of dysentery of the ascending colon which is difficult to distinguish from enteric fever; but the great diagnostic difficulty which medical officers note is the drawing of the line between enteric fever and simple continued fever. Many medical officers, recognising the peculiar danger of mild cases as spreaders of the disease, as well as wishing to err on the safe side for the sake of the patients themselves, are in the habit of treating all cases of continued or remittent fever as enteric fever, until they seem to have proved their innocence. Lastly, most medical officers in investigating an outbreak examine or discuss in succession each source of infection that can be thought of—not only for the first case, but for each individual successive case.

In the case of four patients it is noted that they had previously gone through an attack of the disease, one in Dublin and the others in India. At Agra, it is mentioned, the first cases of the outbreak were more severe than those that followed. The finding of rose spots was very frequently reported both from hill and from plains stations. The presence or absence of albuminuria was not noted in any of the "Medical Transactions." As usual, certain of the *post mortem* records were scarcely typical of the disease.

Bowel complaints.

The death-rates from dysentery and from diarrhœa in the army of India were raised, the former from 0·45 per 1,000 in 1891 to 0·63 in 1892, and the latter from 0·07 to 0·09. Dysentery was most prevalent in the Madras army, least so in the Bombay army. In Bengal the admission rate was higher, whereas in Madras and Bombay it was lower. In no Presidency was the admission ratio higher than that of the 1882–91 decennium. Mortality from dysentery was highest in the Madras army (1·29), lowest in the Bombay army (0·08). In Bengal (0·63) and Madras the

ratio was higher than that of the previous year, and than that of the decennium 1882-91.

Hepatitis. From hepatitis the admission rate (19 per 1,000) remained the same, but the death-rate rose from 1·07 to 1·19. Both ratios were, however, comparatively low. The admission ratio of Madras was, as usual, higher than that of the other presidencies, but the death-rate of Bengal was highest. The Bombay ratios were lowest.. All the ratios of 1892, except the death-rate of Bengal, were lower than the corresponding ratios for the decennium 1882–91.

Respiratory diseases. That there was an increase in respiratory morbidity and mortality was due to the revival of the influenza epidemic. Bengal had the highest admission rate (40 per 1,000), Bombay the lowest (27), while in Madras it was 30 per 1,000. In Bengal and Madras the admission ratios were higher than in 1891, and than the ratio of 1886–91. Bengal had the highest mortality (1·07), Madras the lowest (0·38), Bombay returned 0·47. In Bengal only was the mortality higher than in the preceding year, and than the ratio of 1886–91. The greatest prevalence of respiratory diseases was in the Western Coast, Indus Valley, Burma Coast, and Bengal-Orissa.

The admission and death-rates from pneumonia for the whole army were 3·5 and 0·62 per 1,000 respectively. All the presidency admission rates showed an increase, except that of Madras, but the death-rates of Madras and Bombay were lowered.

Venefeal disease. The "investigation into the venereal statistics of many years back," referred to in last year's report, was contained in a memorandum submitted to Government by the Principal Medical Officer, Her Majesty's Forces in India. One of the principal points sought to be brought out in it was that it is a misleading way of putting it to say that in spite of Lock Hospitals venereal disease increased, and that the real fact is that from some cause, probably the short service system, venereal disease increased generally, but less where there were Lock Hospitals than where there were none. But if the Lock Hospitals really possessed anything like the protective power that was expected from the institution of them, it is reasonable to expect that no cause or influence should have prevailed against them. Nor should they, if the working of them reached all those persons against whom it was intended to protect the troops. It has long been recognised by persons conversant with their management that such was not the case, and probably could not in practice ever be made the case. To this, therefore, and not to any inherent defect in the constitution of them, should be attributed the failure of the Lock Hospitals to check the increase of venereal disease among the troops, who from being younger men, and from restriction of marriage, exposed themselves to risks of contagion much more freely than the men of the older army.

Medical officers now take a much less sanguine view of the good to be effected by the voluntary venereal arrangements in connexion with the cantonment hospitals, because they find that the women, having quite come to realise that no one can force them to come and be cured, have nearly given up attending.

At all the cantonment hospitals of the Bengal Presidency, intended to serve an enormous native population, there were treated only 77,139 patients, of whom only 5,645 were in-patients, and only 4,723 were suffering from venereal disease. The venereal patients have been in-patients or out-patients, males or females, prostitutes or not. The hospitals have now been placed on a different footing, more in line with the charitable dispensaries maintained under civil administration. The statistics are of no value for study in connexion with those of the European troops.

Venereal disease caused *directly* 27 per cent. of the admissions, 0·77 per cent. of the deaths, and 13 per cent. of the invaliding of the Army of India. The admission rate rose 9 per 1,000 of strength above that of 1891. The rise was confined to Bengal and Madras, the ratio of Bombay being reduced.

Admissions from Venereal Diseases in the three Presidencies.

Presidency.	Admissions per 1,000.											
	1870-79.	1881-90.	1882-91.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
Bengal*	209	366	377	291	363	394	356	373	491	504	395	412
Madras	198	367	380	307	350	394	400	376	452	491	402	415
Bombay*	191	339	354	292	272	370	337	357	481	515	417	396
India†	203	360	371	294	343	389	361	371	482	504	401	410

* Excluding troops in Afghanistan during 1881. † Including troops in Afghanistan during 1881.

The year 1884 was the last year in which the Contagious Diseases Acts were in full force. The following table compares the venereal statistics of 1884, 1891, and 1892:—

ARMY OF INDIA.

Venereal Admissions of 1884, 1891, *and* 1892 *compared.*

VENEREAL DISEASES.	1892. Strength 68,137.		1891. Strength 67,030.		1884.* Strength 55,349.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis	6,991	102·6 } 161·1	6,971	104·0 } 159·2	4,992	90·2
Ulcer of penis	3,987	58·5 }	3,700	55·2 }		
Secondary syphilis	3,940	57·8	4,024	60·0	1,352	24·4
Gonorrhœa	10,829	158·9 } 190·9	10,066	150·2 } 181·5	8,070	145·8 } 179·0
Other venereal diseases	2,180	32·0 }	2,101	31·3 }	1,835	33·2 }
Total	27,927	409·9	26,862	400·7	16,249	293·6

* From Annual Returns.

Regarding only the ratios to the right of the brackets, it appears that all the ratios of 1891 and 1892 were higher than those of 1884.

In the Army of Bengal venereal disease caused *directly* 26 per cent. of the admissions, 0·81 per cent. of the deaths, and 10 per cent. of the invaliding. The admission rate rose about 17 per 1,000 of strength over that of 1891. In the Army of Madras venereal disease caused *directly* 34 per cent. of the admissions, 0·61 per cent. of the deaths, and 23 per cent. of the invaliding. The admission rate rose about 13 per 1,000 of strength above that of 1891. In the Army of Bombay venereal disease caused *directly* 25 per cent. of the admissions, 0·61 per cent. of the deaths, and 8 per cent. of the invaliding. The admission ratio fell about 21 per 1,000 below that of 1891.

Invaliding.

In the whole army of India 1,661 men were invalided, or 24·37 per 1,000 of average strength, against 1,793 and 26·78 in the preceding year. The ratio for 1892 was 2·98 per 1,000 less than than of the decennium 1881–90, which was 27·35. The proportion of invalids to strength was lowest in Bombay, highest in Madras.

Forty per cent. of the total number invalided were discharged as unfit for further service. This proportion, as may be seen from the following table, was rather higher than of late years. In Bengal and Bombay the proportion of discharge was greater than in the previous year, while in Madras it remained the same. The proportion was highest in Bombay, and was there unusually high.

Percentage of those Invalided for Discharge to Total Number Invalided.

——	1888.	1889.	1890.	1891.	1892.
Army of India	39	37	35	34	40
„ Bengal	40	37	33	34	40
„ Madras	43	46	43	36	36
„ Bombay	29	25	32	33	45

In the following table the ratios of admission, death, and invaliding in the three armies are given side by side:—

Admission, Death, and Invaliding Rates in the three Presidencies.

YEAR.	BENGAL.*			MADRAS.			BOMBAY.*		
	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†	Admissions per 1,000.	Deaths per 1,000.	Invaliding per 1,000.†
1870–79	1,522	21·00	41·40	1,264	17·69	48·71	1,533	15·27	42·79
1881–90	1,552	14·48	25·89	1,257	12·99	27·59	1,431	13·90	32·00
1890	1,584	15·50	25·05	1,442	12·84	22·68	1,396	9·56	28·87
1891	1,394	16·86	24·64	1,304	14·49	31·28	1,409	14·24	28·98
1892	1,582	19·81	22·57	1,236	12·32	33·05	1,593	12·90	21·53

* Excluding troops in Afghanistan during 1881. † Calculated on the strength derived from annual returns.

The follow table shows the diseases which caused invaliding of not less than 1 per 1,000 of strength:—

Bengal.		Madras.		Bombay.	
Diseases.	Invaliding Rates.	Diseases.	Invaliding Rates.	Disases.	Invaliding Rates.
Debility	3·15	Syphilis and gonorrhœa	7·19	Debility	4·25
Syphilis and gonorrhœa	2·16	Debility	3·63	Syphilis and gonorrhœa	1·74
Malarial fevers	1·85	Rheumatism	2·42	Injuries	1·50
Tubercle of the lungs	1·35	Dysentery	2·34	Malarial fevers	1·50
Mental affections	1·35	Malarial fevers	1·58	Tubercle of the lungs	1·26
Rheumatism	1·16	Other nervous diseases	1·43	Mental affections	1·10
Hepatitis	1·16	Mental affections	1·36	Hepatitis	1·10
Dysentery	1·04	Hepatitis	1·36		
		Tubercle of the lungs	1·13		

Debility and venereal diseases head the list in all three Presidencies. There was an increase in the ratio of invaliding from mental disease in the army of India, and in Bengal, while there was a decrease in Madras and Bombay. There were 46 cases of melancholia, 30 of dementia, and 9 of mania.

The percentage of men who were invalided while under 25 years of age, to the whole number invalided, was 53·41 for the army of India, against 54·01 in the preceding year. The percentage of men under 25 in the strength of the Army of India was 51, as in the previous year.

Of the total number of men invalided 35 per cent. were of less than two years' service, and 77 per cent. were of less than five years' service. With this is to be considered the fact that 79 per cent. of all the men in the strength of the army in 1892 were of less than five years' service.

The percentage to total invaliding of invaliding in the first four years of Indian service was 48 in the period 1871–75, 68 in the period 1881–85, 68 in the period 1886–90, and 65 in 1892; while the percentage of men invalided in the first four years of service who were under 30 years of age has risen from 73 in 1871–75 to 96 in 1892. Of the men invalided under four years of Indian service in 1892, 72 per cent. were also under 25 years of age.

Statistics of Women.

The average strength of women remaining the same, the ratios of sickness and mortality rose to an unusual height.

Strength, Sickness and Mortality of Women in the Army of India.

Years.	Average Annual Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90	3,352	837·5	30·6	18·86
1882–91	3,291	812·1	29·8	17·59
1891	3,137	748·8	27·1	14·03
1892	3,101	904·2	35·8	19·03

The chief causes of admission were debility, ague, and the diseases peculiar to women. Among the chief diseases which caused increased admission were influenza, small-pox, simple continued fever, pneumonia, other respiratory diseases, debility, spleen diseases, malarial fevers, and cholera; while there was a diminution in enteric fever, dysentery, puerperal affections, and entozoa. The admission rate from influenza rose from 1·9 to 5·5. In the Bengal Presidency the admission rate from all causes was 891·0, in Madras 973·6, and in Bombay 852·5; all showing an increase as compared with the previous year. Bengal had the highest ratio for cholera, puerperal affections, and diarrhœa; Madras the highest for influenza, enteric fever, respiratory diseases, tubercle of the lungs, debility, dysentery, rheumatism, entozoa, and diseases peculiar to women; and Bombay the highest for ague. The constantly-sick rate was highest in Madras, lowest in Bombay.

The mortality ratio among women in 1892 is the highest mortality ratio in the above table. The chief causes of death were, in order, puerperal affections, cholera, enteric fever, ague, pneumonia, and other respiratory diseases. The chief increase of mortality was in ague, respiratory diseases, and tubercle of the lungs; and the chief

decrease in nervous and circulatory diseases. In the Bengal Presidency the death-rate was 24·40, in Madras 13·21, and in Bombay 10·29; all higher, especially Bengal, than the ratios of 1891. Bengal had the highest ratio for cholera, dysentery, hepatic abscess, enteric fever, diarrhœa, puerperal affections, and heatstroke; Madras the highest for pneumonia; and Bombay the highest for remittent fever. Madras had no deaths from bowel complaints or hepatitis; Bombay none from enteric fever, respiratory diseases, bowel complaints, or hepatitis. In Bengal the chief increase was in ague and respiratory diseases; in Madras in fevers, respiratory diseases, and puerperal affections; in Bombay in puerperal affections and malarial fevers.

Statistics of Children.

The decline in the average strength of children continued. Sickness was greater, but mortality was somewhat reduced.

Strength, Sickness and Mortality of Children in the Army of India.

Years.	Average Strength.	Admission-rate per 1,000.	Constantly sick-rate per 1,000.	Death-rate per 1,000.
1881–90 - - -	6,286	633·5	23·4	50·22
1882–91 - - -	6,220	609·4	22·2	50·63
1891 - - -	5,886	509·0	19·2	49·27
1892 - - - -	5,762	564·6	22·0	48·59

The chief causes of admission were ague, respiratory diseases, and debility. The greatest increase of admission was in influenza, remittent fever, simple continued fever, and pneumonia, and the greatest decrease in cholera, bowel complaints, and entozoa. In the Bengal Presidency the admission rate was 516, in Madras 656, and in Bombay 586; Madras only having a lower ratio than in the previous year.

The mortality among children, though lower than in 1891, was higher than in 1889 or 1890. The chief causes of death were, in order, convulsions, debility, diarrhœa, respiratory diseases, croup and diphtheria, teething, remittent fever, and tubercle. The greatest increase of mortality was in diphtheria and croup, enteric fever, remittent fever, and simple continued fever; and the greatest decrease in measles, tubercle of the meninges and brain, teething, dysentery, and diarrhœa. In the Bengal Presidency the death ratio was 57·01, in Madras 30·30, and in Bombay 47·62; Bengal being the only Presidency which had a higher death-rate than in the previous year, and Madras showing the greatest decrease.

Native Troops.

Sickness and mortality in 1892.

While sickness in the Native Army of India was increased by the prevalence of influenza and malaria, mortality was reduced. The cholera mortality, though still high, was less than in the preceding year.

Sickness and Mortality of the periods 1877–81, 1881–90, *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1877–81 -	118,669	1,422	48	1·94	24·90	27·40
1881–90 - -	116,712	1,054	35	1·28	13·44	16·91
1882–91 - -	118,111	1,020	34	1·45	13·09	16·61
1891 - -	128,600	972	35	2·64	15·44	19·34
1892 - -	127,355	1,092	37	2·14	14·97	18·67

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission-rates were influenza, small-pox, "other fevers," respiratory diseases, and ague. Among those with lessened rates were cholera, diarrhœa, and guinea-worm. Ague caused 48 per cent. of the total admissions.

The chief causes of death were pneumonia, cholera, and remittent fever. Among the diseases which caused increased mortality were tubercle of the lungs, dysentery, and hepatitis. Among those from which mortality was lessened were suicide, ague, diarrhœa, and cholera. Pneumonia caused 22 per cent. of the total deaths, and cholera 14 per cent.

The chief causes of invaliding in the Native Army were debility, rheumatism, malarial fevers, and respiratory diseases.

If the statistics of native troops be compared with those of European troops, it will be seen how much less the Native soldier suffered from enteric fever, simple continued fever, heatstroke, nervous diseases, circulatory diseases, tubercle of the lungs, tonsillitis, diarrhœa, hepatitis, rheumatism, venereal diseases, injuries, and how much more he suffered from influenza, cholera, small-pox, ague, pneumonia, other respiratory diseases, dysentery, spleen diseases, scurvy, eye diseases, entozoa, and diseases of the integuments, than his European comrade.

In page 43 explanations regarding decennial statistics will be found. In the case of the Native Army it is necessary to confine the comparison of decennia to the Bengal Army, as there are no available records going far enough back for the other corps. The following tables are therefore for the Bengal Army only. They show that sickness for the decennium 1881–90 was lower than in either of the other decennia, while mortality, which was higher in 1870–79, sank again in 1881–90:—

Admitted per 1,000 *of Strength.*

Diseases.	Bengal Army.		
	1881–90.	1870–79.	1867–76.
Cholera	1·9	3·3	3·8
Enteric Fever*	·2	·4	·3
Ague†	593·5	805·5	744·6
Phthisis pulmonalis	3·2	2·5	2·1
Respiratory Diseases‡	57·9	67·3	51·6
Dysentery	60·8	89·7	75·5
Diarrhœa	26·3	51·3	47·2
Scurvy	2·7	3·1	2·7
Venereal diseases	34·3	33·0	34·7
Guinea-worm§	1·8	1·7	—
All causes	1,200·2	1,521·1	1,424·8
Constantly sick-rate	38·1	47·1	43·4

* From 1872.
† Including febricula up to 1885 inclusive.
‡ Including tonsillitis up to 1885 inclusive.
§ From 1878.

Died per 1,000 *of Strength.*

Diseases.	Bengal Army.		
	1881–90.	1870–79.	1867–76.
Cholera	1·15	2·05	2·24
Enteric fever*	·10	·18	·14
Ague	·74	2 10	1·53
Phthisis pulmonalis	·90	·80	·72
Respiratory diseases	4·63	5·29	3·02
Dysentery	·94	1·65	1·08
Diarrhœa	·73	1·09	·76
Scurvy	·08	·12	·13
Anæmia and debility	·43	·63	·47
All causes	14·27	19·37	14·25

* From 1872.

The decennium 1881–90 compares favourably with its predecessors in respect of both sickness and mortality from cholera, ague, dysentery, and diarrhœa;

unfavourably in respect of sickness and mortality from phthisis pulmonalis; while in respect of sickness and mortality from respiratory diseases it occupies an intermediate position.

A table for the ten-year period 1882–91 for Native troops will be found after the annual tables. The system of numbering adopted is explained in pp. 44, 45. It has not been found possible to complete the Native Army series of 1882–91 tables this year. Next year the tables for groups and stations will also be given, as well as those for corps, but, of course, for 1883–92. At the foot of Decennial Table 7 are given, for convenience of reference, the ratios for India, year by year, of some of the principal diseases.

Bengal Army.

The sickness of the native army of Bengal was increased by influenza and malaria; but mortality was somewhat diminished unless those who died while absent from their regiments be included. Cholera mortality was less, though still high.

Sickness and Mortality of the ten-year periods, 1867–76, 1881–90, *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality, including absent Deaths.
				Cholera.	All Causes.	
1867–76 *	39,508	1,360	42	2·12	13·84	17·25
1881–90	55,244	1,200	38	1·15	14·27	18·22
1882–91	56,963	1,150	37	1·49	13·91	17·71
1891 †	66,230	1,021	35	3·73	17·32	18·06
1892 ‡	65,594	1,234	40	2·58	16·53	19·70

* Excluding Punjab Frontier Force. † Excluding certain men on escort duty.
‡ Excluding certain men at Panjgur and on the march.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were influenza, enteric fever, "other fevers," heatstroke, ague, respiratory diseases, and dysentery. Among those with lessened rates were cholera, remittent and simple continued fevers, and guineaworm. Ague caused 51 per cent. of the admissions.

The chief causes of death were pneumonia, cholera, remittent fever, and respiratory diseases other than pneumonia. Among the diseases which caused increased mortality were heatstroke, enteric fever, pneumonia, other respiratory diseases, and dysentery. Among those from which mortality was lessened were small-pox, injuries, cholera, suicide, hepatitis, and spleen diseases. Pneumonia caused 25 per cent. of the total deaths, cholera 16 per cent., and remittent fever 11 per cent.

The chief causes of invaliding were debility and rheumatism.

Corps of Central India and Rajputana.

In all respects the statistics of the corps in Central India and Rajputana were worse than in the previous year.

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				
		Admissions into Hospital.	Constantly Sick.	Deaths from		Mortality including absent Deaths.
				Cholera.	All Causes.	
1881–90	5,161	709	21	·43	8·27	9·46
1882–91	5,175	690	20	·48	7·85	9·03
1891	5,175	629	20	·58	7·73	8·96
1892	5,128	777	21	2·54	9·56	10·50

The chief causes of admission were ague, injuries, and diseases of the integuments. Among the diseases with raised admission rates were cholera, hepatitis, influenza, and ague. Among those with lessened admission rates were guineaworm, "other fevers," pneumonia, and dysentery. Ague caused 48 per cent. of the total admissions.

The chief causes of death were cholera, pneumonia, and remittent fever. Among the diseases with increased mortality were cholera, ague, and dysentery. Among those with lessened mortality were heatstroke, injuries, suicide, and circulatory diseases. Cholera caused 26 per cent. of the total deaths, and pneumonia 24 per cent.

Madras Army.

The health of the native army of Madras improved, though cholera increased. It will be observed that the ratios compare unfavourably with those of the decennia; but it must be remembered that Burma was not in occupation during the whole of either decennium.

Sickness and Mortality of the ten-year periods 1881–90, *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				Mortality, including absent Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1881–90 - -	25,960	835	33	1·98	12·99	27·87
1882–91 - -	25,715	836	34	2·05	13·81	18·94
1891 - - -	26,088	1,017	46	1·99	20·05	27·32
1892 - -	25,963	868	38	2·27	18·53	26·00

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were influenza, small-pox, cholera, and pneumonia. Among those with lessened admission rates were spleen diseases, dysentery, and malarial fevers. Ague caused 39 per cent. of the total admissions.

The chief causes of death were cholera, pneumonia, debility, ague, dysentery, and remittent fever. Among the diseases which caused increased mortality were simple continued fever, pneumonia, hepatitis, injuries, and cholera. Among those from which mortality was lessened were ague, diarrhœa, and remittent fever. Cholera caused 12 per cent. of the total deaths, pneumonia nearly 12 per cent., debility 11 per cent., and ague 10 per cent.

The chief causes of invaliding were debility and malarial fevers.

The following table shows the statistics of all the troops serving in Burma and the Andamans. Of these troops the Madras Army furnished in 1892 about 84 per cent. :—

Year.	Average Annual Strength present.	Ratio per 1,000 of Strength.			
		Admissions into Hospital.	Constantly Sick.	Deaths from	
				Cholera.	All Causes.
1891 - -	11,401	1,676	76	1·75	36·31
1892 - -	11,333	1,349	57	2·29	29·12

The health of the native army of Bombay somewhat deteriorated, though cholera mortality was reduced. Bombay Army.

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				Mortality, including absent' Deaths.
		Admissions into Hospital.	Constantly Sick.	Deaths from		
				Cholera.	All Causes.	
1881–90 - - -	23,140	1,151	38	1·12	14·58	16·74
1882–91 - -	23,024	1,098	36	1·11	12·88	15·35
1891* - - -	23,780	978	31	1·26	9·63	12·34
1892* - -	23,355	1,130	34	·81	10·10	12·48

* Excluding certain men on escort duty.

The chief causes of admission were ague, diseases of the integuments, injuries, and dysentery. Among the diseases with raised admission rates were small-pox, malarial fevers, and dysentery. Among those with lessened rates were influenza, cholera, and enteric fever. Ague caused 50 per cent. of the total admissions.

The chief cause of death was pneumonia. Among the diseases which caused increased mortality were tubercle of the lungs, injuries, and pneumonia. Among those with lessened mortality rates were debility, enteric fever, cholera, and remittent fever. Pneumonia caused 26 per cent. of the total deaths.

The chief causes of invaliding were debility and respiratory diseases.

The health of the Hyderabad Contingent was worse than in the preceding year, and the ratios compare unfavourably also with those of the decennia. Cholera mortality was increased. Hyderabad Contingent.

Sickness and Mortality of the ten-year periods 1881–90 *and* 1882–91, *and of the years* 1891 *and* 1892.

Year.	Average Annual Strength present.	Ratio per 1,000.				Mortality including absent deaths.
		Admissions into Hospital.	Constantly sick.	Deaths from		
				Cholera.	All causes.	
1881–90 - -	6,673	590	20	·78	6·28	8·11
1882–91 - -	6,672	575	20	·84	6·10	8·04
1891 - - -	7,063	529	19	1·13	6·09	7·83
1892 - -	7,058	681	22	1·70	7·08	8·35

The chief causes of admission were ague, diseases of the integuments, injuries, and influenza. Among the diseases with raised admission rates were influenza, simple continued fever, small-pox, pneumonia, other respiratory diseases, and ague. Among those with lessened rates were remittent fever, tubercle of the lungs, dysentery, and rheumatism. Ague caused 36 per cent. of the total admissions.

The chief causes of death were cholera, pneumonia, and injuries. Among the diseases which caused increased mortality were circulatory diseases, cholera, pneumonia, and injuries. Among those with lessened rates were malarial fevers, and respiratory diseases other than pneumonia. Cholera caused 24 per cent. of the total deaths, pneumonia 22 per cent., and injuries 18 per cent.

Having considered individually the health statistics of the several portions of the native army of India in the foregoing paragraphs, it will now be convenient to contrast Comparison of Corps.

the main features of the same; and for ready reference the chief results are brought together in the following table:—

Corps.	Total Deaths per 1,000, including Absentees.	Average Strength present.	Ratio per 1,000.			
			Admissions into Hospital.	Constantly Sick.	Deaths from Cholera.	Present Deaths from all Causes.
India - - -	18·67	127,355	1,092	37	2·14	14·97
Bengal Army - - - -	19·70	65,594	1,234	40	2·58	16·53
Corps of Central India and Rajputana	10·50	5,128	777	21	2·54	9·56
Madras Army - - -	26·00	25,963	868	38	2·27	18·53
Bombay Army - - - -	12·48	23,355	1,130	34	·81	10·10
Hyderabad Contingent - -	8·35	7,058	681	22	1·70	7·08

As usual, the health of the Hyderabad contingent and of the Corps of Central India and Rajputana was the best. Sickness was greatest in the Bengal Army, and mortality in the Madras Army.

Geographical groups of India.

For the reasons given in page 62 the decennial figures cannot this year be inserted in the following table. As it stands, the table shows that, in the comparison of 1892 and 1891, Groups VI., VII., and XI. come out worst:—

		Ratio per 1,000 of Strength.												
		I. Burma Coast and Bay Islands.	II. Burma Inland.	III. Assam.	IV. Bengal and Orissa.	V. Gangetic Plain and Chutia Nagpur.	VI. Upper Sub-Himalayan.	VII. Indus Valley and North-Western Rajputana.	VIII. South-Eastern Rajputana, Central India, and Gujarat.	IX. Deccan.	X. Western Coast.	XI. Southern India.	XII. Hill Stations.	India.
1891	Constantly sick rate -	57·3	88·4	77·4	54·4	31·5	30·1	35·8	24·2	26·8	22·8	26·0	47·5	35·2
	Death-rates from—													
	Cholera - - -	—	2·42	·93	·96	·85	·57	1·31	·71	1·58	—	1·42	1·01	2·64
	Respiratory diseases -	3·79	2·54	3·71	·96	3·11	3·41	7·78	2·64	2·17	·54	1·94	7·33	3·56
1892	Constantly sick rate -	75·4	57·4	72·4	57·2	28·8	36·6	45·2	29·5	28·3	23·7	26·8	45·0	36·7
	Death-rates from—													
	Cholera - - -	—	2·52	·80	—	2·10	2·48	3·24	1·43	·89	—	3·75	3·04	2·14
	Respiratory diseases -	2·81	3·08	3·18	·68	1·95	6·67	9·22	2·36	2·04	1·38	2·54	5·59	4·27

The highest constantly sick ratio was that of Burma Coast, and the lowest that of Western Coast. The highest admission ratio was that of Assam, and the lowest that of Southern India. Burma Coast had the highest admission ratios from spleen diseases, rheumatism, eye diseases, and diseases of the integuments, and no influenza, phthisis, or guinea-worm; Burma Inland the highest from diarrhœa; Assam the highest from influenza, small-pox, enteric fever, dysentery, venereal diseases, and entozoa other than guinea-worm; Bengal-Orissa the highest from tubercle of the lungs, respiratory diseases other than pneumonia, and hepatitis; Indus Valley the highest from ague and pneumonia, and the lowest from venereal diseases; Central India the highest from guinea-worm; Western Coast the highest from simple continued fever and urinary diseases, and the lowest from pneumonia, tonsillitis, and spleen diseases; Southern India the highest from cholera, and the lowest from malarial fevers, respiratory diseases other than pneumonia, bowel complaints, and scurvy; the Hills the highest from remittent fever, "other fevers," tonsillitis, and scurvy.

The highest death ratio was that of Burma Inland, and the lowest that of Western Coast. Burma Inland had the highest death-rates from ague, dysentery, diarrhœa, spleen diseases, and debility; Assam the highest from small-pox, enteric fever, injuries, and suicide; Bengal-Orissa the lowest from pneumonia; Upper Sub-Himalayan the highest from heatstroke; Indus Valley the highest from remittent fever and pneumonia; Southern India the highest from cholera, and the lowest from respiratory diseases other than pneumonia; the Hills the highest from tubercle of the lungs, abscess of the liver, and respiratory diseases other than pneumonia.

Influenza greatly increased, there having been 1,795 cases, or 14·1 per 1,000 of strength, and 19 deaths, or 0·15 per 1,000 of strength, against 899, or 7·0, and 12, or 0·09 in the preceding year. The number of stations affected was 58 against 17, and of them 12 had also been affected in 1891. In 1892 ten groups were affected against eight; III., V., VI., VII., VIII., IX. and XII. were affected in both years; II., X., and XI., only in 1892, and I. only in 1891. It has already been mentioned that in proportion to strength Assam was most severely affected. The groups in which most cases occurred were the Deccan, the Hills, and the Gangetic Plain, and there were no cases only in Burma Coast and Bengal-Orissa. The revival of the epidemic really began in December of 1891. The maximum was reached in January, with a second rise in March, and again a slight rise at the end of the year. The greatest number of cases occurred at Hingoli, Dharmsala, Lucknow, and Jubbulpore, the two latter having had compact outbreaks. Mild cases were doubtless not always admitted, and diagnosis was probably sometimes uncertain. The following table shows that the Native were more severely affected than the European troops, much less severely than the prisoners. It also shows how both sickness and mortality from pneumonia rose in all three bodies:— Principal diseases: Influenza.

	Per 1,000 of Average Strength.											
			Increase or Decrease as compared with 1891.									
	Influenza.		Pneumonia.		Other Respiratory Diseases.		Simple continued Fever.		Ague.		All causes.	
	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.	Admission.	Death.
European Troops	12·7	·01	+·9	+·08	+·4	−0·3	+12·1	+·03	+85·6	+·10	+138·2	+1·18
Native Troops	14·1	·15	+2·0	+·73	+·7	−·02	+·2	−·04	+98·1	−·34	+120·0	−·47
Prisoners	56·7	1·26	+1·4	+·69	−·5	−·42	−10·7	−·09	+106·5	+·28	+143·3	+1·94

Cases of cholera occurred from March onwards, the maximum being in May. The admission rate was 3·3 per 1,000 of strength, the death-rate 2·14 per 1,000 of strength, and the fatality 62·03 per cent. of cases treated, against, respectively, 4·5, 2·64, and 56·77. In Southern India the cases bore the highest proportion to strength. The greatest number of cases occurred in the Hills, the Upper Sub-Himalayan, the Indus Valley, and Southern India. The Gurkhas at Almora had 60 cases, 58 in May and two in June. Cholera.

To fevers returned as malarial were due 49 per cent. of the sickness and 16 per cent. of the mortality of the Native Army. The admission per 1,000 of strength from these fevers rose in 1892, while the death-rate fell. Fevers.

The ratio of admission from enteric fever in the Native Army in 1892 was 0·4 per 1,000 of strength, and the death-rate 0·13. The corresponding decennial ratios of the period 1882–91 were 0·3 and 0·09. The following table shows that the ratios for European troops are very unlike those for Native troops and prisoners:—

Admission and Death Rates per 1,000 *from Enteric Fever in the European Troops, Native Troops, and Jails of India compared.*

	1882 to 1891.		1892.	
	Admissions.	Deaths.	Admissions.	Deaths.
European troops	14·7	4·13	22·1	5·52
Native troops	·3	·09	·4	·13
Jail population	·2	·10	·3	·15

Post-mortems are rarely obtained in the case of Native soldiers, but among prisoners nearly every fatal case of disease is subjected to *post-mortem* examination. Under these circumstances the fact that the ratios of prisoners and sepoys for a ten-year period (*see* also the tables in paragraphs 66 and 96) are practically identical, appears to show that the Native troops really suffer less than the European. Again, the following table shows that the fever mortality in the European and Native armies is not the same in amount, which indicates that the difference is not a mere matter of diagnosis.

Fever Mortality of Native Troops compared with that of European Troops in 1892.

Causes of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentage in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total=100.	European Troops.	Native Troops.
Ague	·28	·98	22·2	77·8	100	1·6	6·6
Remittent fever	1·10	·142	43·7	56·3	100	6·4	9·5
Simple continued fever	·04	·05	44·4	55·6	100	·3	·3
Enteric fever	5·52	·13	97·7	2·3	100	32·3	·8
Total	6·94	2·58	72·9	27·1	100	40·6	17·2

The total fever mortality among the native troops in 1892 was to the total fever mortality among European troops as 1 : 2·7. For the period 1886–91 the corresponding ratio was 1 : 1·9, and for 1891 it was 1 : 2·0. Again, among European troops 41 per cent. of all deaths in 1892 were from fevers, only 17 per cent. among Native troops. It appears, then, that native soldiers and prisoners are less liable to contract enteric fever than Europeans are. At a meeting of the Calcutta Medical Society, reported in the "Indian Medical Gazette" of May, 1893, Dr. Crombie showed from an examination of 20 years' records of the Calcutta Hospitals, institutions where *post-mortem* examinations of fever cases are constantly being carried out, the rarity of enteric fever among native patients; and mentioned that he himself was not aware of ever having seen a case of enteric fever in a native of Bengal, though he had seen cases among Gurkhas and Burmans.

In the whole Native Army of India 54 cases with 16 deaths were returned as enteric fever, as against 35 with 17 in 1891. Of the deaths, 14 were in the Bengal Army, and two in the Bombay Army.

Dysentery.

From dysentery the admission and death rates were higher than in the preceding year, the former by 5·6, and the latter by 0·09 per 1,000 of strength. The highest admission rate was that of Assam, and the lowest that of Southern India; the highest death-rate was that of Burma Inland, and there were no deaths in Western Coast. On comparing the tables for European troops with those for Native troops, it will be seen that the death-rate of Natives from dysentery was to that of Europeans as 1·5 : 1, and that dysentery caused 6·4 per cent. of all the deaths of Native soldiers, but only 3·7 per cent. of the deaths of European soldiers. In 1891 these percentages were respectively 5·6 and 2·8.

Respiratory diseases.

The following table shows the ratios of admission from respiratory diseases in the principal divisions of the Native Army:—

Period.	Ratio of Admission per 1,000 of Strength.					
	India.	Bengal.	Corps of Central India and Rajputana.	Madras.	Bombay.	Hyderabad Contingent.
1881–85	56	56	38	27	91	25
1886–91	47	51	34	27	65	23
1891	50	61	32	36	50	20
1892	53	66	37	37	44	35

Except in the case of Bombay, the ratios were higher than in the previous year. This was probably due to the revival of the influenza epidemic. Increase was greatest in the case of the Hyderabad Contingent.

As respiratory disease is the chief cause of death in the Native Army, the following is given to compare the present with the past in respect thereof:—

Period.	Ratio per 1,000 of Strength.					
	Deaths from Respiratory Diseases.					
	India.	Bengal.	Corps of Central India and Rajputana.	Madras.	Bombay.	Hyderabad Contingent.
1881–85	4·24	4·15	3·37	1·53	6·73	1·40
1886–91	3·41	4·25	2·72	1·60	3·80	1·52
1891	3·56	4·63	3·29	2·07	2·74	1·98
1892	4·27	5·51	2·93	2·74	3·51	1·99

All the corps-ratios, except that of Central India and Rajputana, were higher than in 1891, and all except Bombay were higher than in 1886–91.

The highest mortality from respiratory diseases other than pneumonia was, as in the preceding year, in the Hills.

The following table gives the admission and death rates per 1,000 from pneumonia in 1892, and shows a general deterioration, except in the case of Central India and Rajputana:—

Period.	India.		Bengal.		Corps of Central India and Rajputana.		Madras.		Bombay.		Hyderabad Contingent.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
1891	11·6	2·53	14·9	3·35	12·4	2·71	7·2	1·53	9·5	1·77	3·7	·99
1892	13·6	3·26	17·4	4·18	11·9	2·34	9·3	2·16	9·5	2·65	9·2	1·56

Then follows a table from which may be seen at a glance the incidence of mortality from pneumonia in the various geographical groups:—

	Groups.												
	Burma Coast and Bay Islands.	Burma Inland.	Assam.	Bengal and Orissa.	Gangetic Plain and Chutia Nagpur.	Upper Sub-Himalayan.	Indus Valley and N. W. Rajputana.	S. E. Rajputana, Central India and Gujarat.	Deccan.	Western Coast.	Southern India.	Hill Stations.	Army of India.
Death-rates per 1,000 of average annual strength.	2·25	1·96	1·99	·34	1·35	5·02	7·57	1·79	1·57	·55	2·42	3·91	3·26
Percentages in total deaths.	9·8	6·6	9·1	3·7	16·7	30·4	34·7	22·7	20·8	9·5	16·8	19·3	21·8

It shows high mortality from pneumonia in the Indus Valley and in the Upper Sub-Himalayan. It also shows the high percentage of pneumonia to the total death-causes

in those regions. Again, from the following, it may be gathered that in 1892 the mortality of Native soldiers from pneumonia was more than five times as great as that of European soldiers.

Cause of Death.	Died per 1,000 of Average Strength.		Relative Liability in Percentages.			Percentages in Deaths from all Causes.	
	European Troops.	Native Troops.	European Troops.	Native Troops.	Total =100.	European Troops.	Native Troops.
Pneumonia	·62	3·26	16·0	84·0	100	3·6	21·8

Venereal diseases.

In the case of European troops the number of cases of "other venereal diseases" was checked by correspondence with every station in India, but it was not possible to carry out this check in the case of Native troops. It is probable, therefore, that negligence in return may have made the number of "other venereal diseases" shown in this report somewhat too high. The following statements are given to correspond with those already given for European troops. The first shows that the venereal ratio for India of 1892 was somewhat higher than that of 1891 and that the ratios of the armies of Bengal, Madras, and Bombay were raised, while the ratios of the two smaller corps were lowered.

Venereal Disease in the Native Army of India.

Corps.	Admission per 1,000 of Strength.			
	1866.	1884.	1890.	1891.
Bengal Army	47·6	31·3	35·5*	37·5*
Corps of Central India and Rajputana	59·3	18·1	21·1	17·4
Madras Army	22·6	22·6	42·7	45·5
Bombay Army	No record	32·1	47·0	49·6
Hyderabad Contingent	No record	16·4	23·5	21·1
India	Incomplete	27·9†	37·9*†	39·6*†

* Including Native drivers of European batteries. † Including mixed troops of Bengal, Madras, and Bombay.

The second shows, taking the figures to the right of the brackets, that the ratios of the different forms of venereal disease were higher in 1892 than in 1891.

Venereal Diseases.	1884.* Strength 127,477.		1891. Strength 128,600.		1892. Strength 127,355.	
	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.	Admissions into Hospital.	Ratio per 1,000.
Primary syphilis	1,266	9·9 } 9·9	1,206	9·4 } 13·6	1,166	9·2 } 14·1
Ulcer of penis	—	— }	548	4·3 }	635	5·0 }
Secondary syphilis	609	4·8	887	6·9	1,001	7·9
Gonorrhœa	959	7·5 } 10·1	1,377	10·7 } 17·3	1,440	11·3 } 17·6
Other venereal diseases	333	2·6 }	853	6·6 }	800	6·3 }
Total	3,167	24·8	4,871	37·9	5,042	39·6

* From Annual Returns and excluding Native drivers of European batteries.

The third shows that the ratios of both European and Native troops for 1892 were higher than the corresponding ratios of 1891; that Madras was worst in the case of European troops, and Bombay best; that Bombay was worst in the case of Native troops, and Bengal best, and that in all cases, as usual, the ratios of the European troops were higher than those of the Native troops. Among the European troops of India, there were 410 admissions to every 1,000 men, among the Native troops only 40.

A Comparative Summary of Venereal Disease in the European and Native Armies.

	1884.				1891.				1892.			
	European Troops.		Native Troops.		European Troops.		Native Troops.		European Troops.		Native Troops.	
	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.	Admissions.	Ratio per 1,000.
Army of Bengal	9,781	290·6	1,608	31·3	16,203	395·3	2,354	35·5	17,403	412·4	2,458	37·5
Army of Madras	3,308	306·7	635	22·6	5,357	402·1	1,115	42·7	5,489	415·0	1,182	45·5
Army of Bombay	3, 27	291·6	750	32·1	5,302	417·1	1,118	47·0	5,035	396·1	1,159	49·6
Army of India	16,166	293·9	3,200	27·9	26,862	400·7	4,871	37·9	27,927	409·9	5,042	39·6

The fourth, again, shows that the increase-decrease of secondary syphilis in both Native and European troops in 1892 was slight, and that the secondary syphilis of Native troops runs at an altogether lower level than the secondary syphilis of European troops.

Comparison of the Secondary Syphilis Ratios of the European and Native Armies.

	1884.	1891.	1892.
European troops	24·4	58·5	57·8
Native troops	4·8	6·9	7·9

It is, of course, but natural that the ratios of the Native troops should be much less than those of the European troops, considering the very different environment of the two bodies of men.

Jails.

Sickness and mortality in 1892.

There was an increase, as shown in the subjoined table, of the average jail population in 1892. Influenza, malaria, and cholera being prevalent, there was increased sickness and mortality. Mortality from dysentery was much increased.

Statement showing the Sickness and Mortality among the Prisoners of India during 1877–81, 1881–90, 1882–91, 1891, *and* 1892.

Year.	Average Annual Strength.	Ratio per 1,000.			
		Admissions into Hospital.	Constantly Sick.	Deaths from	
				Cholera.	Dysentery and Diarrhœa.	All Causes.
1877–81	112,670	1,189	45	4·48	24·97	63·01
1881–90	89,978	1,113	39	2·91	11·72	34·96
1882–91	89,642	1,093	38	2·91	10·77	33·61
1891*	101,019	1,043	37	3·09	8·42	31·89
1892†	103,159	1,186	41	4·73	9·77	36·83
* Including the subsidiary jails	104,435	1,046	37	—	—	31·50
† Including the subsidiary jails	106,739	1,180	41	—	—	36·43

The chief causes of admission were ague, dysentery, abscess, diarrhœa, and influenza. Among the diseases with raised admission rates were influenza, cholera, malarial fevers, debility, pneumonia, bowel complaints, and abscess. Among those from which admission-rates were lower were simple continued fever, respiratory diseases other than pneumonia, eye diseases, and entozoa. Ague caused 42 per cent. of the total sickness, and bowel complaints 15 per cent.

The chief causes of death were dysentery, pneumonia, and cholera. Among the diseases which caused increased mortality were dysentery, debility, cholera, enteric

fever, nervous diseases, and pneumonia. Among those from which mortality was lessened were "other fevers," diarrhœa, and injuries. Dysentery caused 21 per cent. of the total deaths, pneumonia 15 per cent., and cholera 13 per cent.

Proportion of prisoners in population.

The following statement shows for each administration the proportion of prisoners in 10,000 of the population :—

Ratio of Prisoners per 10,000 *of Population in each of nine Administrations for* 1891 *and* 1892. (*Andamans excluded.*)

Administrations.	Period.	General Population, according to Census of 1891.	Prisoners.		
			Average Number.*	Proportion to 10,000 of Population.	Deaths per 1,000 of Average Strength.*
Burma	1891	7,605,560	11,444	15·0	30·23
	1892		11,844	15·6	33·10
Assam	1891	5,476,833	1,322	2·4	63·54
	1892		1,290	2·4	58·91
Bengal	1891	71,346,987	15,917	2·2	30·97
	1892		17,178	2·4	37·32
N.-W. Provinces and Oudh	1891	46,905,085	28,268	6·0	27·63
	1892		27,505	5·9	29·19
Punjab	1891	20,866,847	12,439	6·0	28·38
	1892		12,853	6·2	30·19
Bombay	1891	18,901,123	7,543	4·0	32·48
	1892		7,552	4·0	36·94
Berar	1891	2,879,491	1,065	3·7	11·27
	1892		1,224	4·2	17·16
Central Provinces	1891	10,784,294	4,675	4·3	30·37
	1892		4,716	4·4	44·95
Madras	1891	35,630,440	9,779	2·7	35·08
	1892		11,095	3·1	45·43

* Including subsidiary jails.

An explanation has been given in page 43 with regard to decennial statistics. In the case of jails the statistics of India as a whole are not available before 1877. The comparison of decennia must in this case, therefore, be confined to the "Bengal Presidency," which comprises the administrations of Assam, Bengal, the North-Western Provinces, and Oudh, the Punjab, and the Central Provinces. The following tables compare the decennium 1881–90 with the decennium 1870–79, and also with the decennium 1867–76, which, of course, partially overlaps 1870–79 :—

Jails of the Bengal Presidency.

Admitted per 1,000 *of Strength.*

Admissions from	1881–90.	1870–79.	1867–76.
Ague*	458	451	417
Dysentery	112	110	103
Diarrhœa	100	95	90
Respiratory diseases†	46	41	37
Anæmia and debility	28	19	14
Spleen diseases	9	8	8
Phthisis pulmonalis	5	4	4
Cholera	5	8	8
Scurvy	3	4	3
Hepatitis‡	1	1	1
Total from all causes	1,088	1,046	1,000
Constantly sick per 1,000 of Strength	36	34	31

* Including febricula up to 1885 inclusive.

† Including tonsillitis and sore throat from 1867 up to 1885 inclusive.

‡ Including hypertrophy and simple enlargement of the liver from 1867 up to 1885 inclusive.

Died per 1,000 *of Strength.*

Deaths from	1881–90.	1870–79.	1867–76.
Dysentery	8·37	13·03	15·58*
Respiratory diseases	6·83	6·25	4·81
Diarrhœa	4·80	5·46	†
Cholera	2·99	3·63	3·42
Anæmia and debility	2·24	2·89	2·20
Phthisis pulmonalis	2·16	2·43	2·19
Ague	·93	1·82	‡
Spleen diseases	·26	·36	·39
Hepatitis	·19	·15	·17
Scurvy	·11	·12	·09
Total from all causes	36·41	45·77	38·63

* Including diarrhœa. † Included in dysentery. ‡ Not separated from other fevers.

In reading these tables attention must be paid to the footnotes. There has been an improvement in the general death-rate, and in the death-rate from all the diseases shown in the table, except respiratory diseases and hepatitis; and, as far as is known, this improvement may be put down to increased attention to sanitation. At the same time the constantly sick-rate and the general admission-rate have risen, as also the admission-rates from all the diseases given, except cholera and scurvy. This curious result might be due to increase of non-fatal diseases, but may, not improbably, be owing to greater care taken to admit sick men into hospital, instead of treating large numbers of them as out-patients. This latter explanation rather gains support from the fact of cholera forming an exception, as just noted; as prisoners suffering from cholera are not likely ever to have been treated as out-patients.

The tables for 1892–91 will be found after the annual tables belonging to this section. The system of numbering adopted, and other matters concerning them, have been explained in page 44. At the foot of Table 15 the ratios for India of some of the chief diseases have been given year by year for convenience of reference. Extracts from these decennial tables will be found in most of the minor tables throughout this section.

The following table shows the proportion in which some of the principal diseases entered into the composition of a hundred deaths in each administration:—

Causes of Death.	Composition of 100 deaths.									
	Andamans.	Burma.	Assam.	Bengal.	North-Western Provinces and Oudh.	Punjab.	Bombay.	Berar.	Central Provinces.	Madras.
Cholera	—	27·3	16·2	10 9	5·1	7·5	2·6	—	21·7	38·2
Fevers	14·4	6·1	4·4	10·7	6·6	7·7	10·7	—	4·7	1·9
Pneumonia	11·4	10·7	11·8	14·4	14·7	38·1	24·6	4·8	10·4	3·4
Dysentery and diarrhœa	39·8	18·9	33·8	30·4	21·1	18·6	23·9	23·8	28·8	27·1
Tubercle of the lungs	—	7·9	—	5·1	6·6	5·9	·4	4·8	·5	3·2
Anæmia and debility	10·5	3·6	4·4	3·8	8·5	1·5	10·3	—	7·5	3·2
All causes	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

The Andamans had the highest mortality from remittent fever, respiratory diseases other than pneumonia, dysentery, and debility, and, as usual, no cholera; Burma the highest mortality from tubercle of the lungs; Assam the highest mortality from small-pox, diarrhœa, spleen diseases, and all causes, and no deaths from tubercle of the lungs or scurvy; Bengal the highest mortality from ague; the Punjab the highest mortality from heatstroke, pneumonia, and sloughing; Bombay the highest mortality from simple continued fever and scurvy; Berar the highest mortality from nervous diseases, circulatory diseases, and injuries, and no deaths from cholera, fevers, scurvy,

or debility; the Central Provinces the highest mortality from "other fevers" and urinary diseases; Madras the highest mortality from cholera and enteric fever, and the lowest from pneumonia.

In the Andamans the health of the prisoners was worse than in the preceding year, this being due to influenza and increased malaria following the great cyclone of the preceding November. The constantly sick rate rose from 59 per 1,000 of average strength to 60 and the death-rate from 41·47 to 50·78. The chief causes of admission were ague, dysentery, respiratory diseases other than pneumonia, and abscess, &c. The admission-rates from influenza, malarial fevers, respiratory diseases, bowel complaints, debility, and scurvy were raised; while those from tubercle of the lungs, spleen diseases, and diseases of the integuments were lowered. The settlement remained free from cholera. Ague caused 55 per cent. of the total sickness. The chief causes of death were dysentery, respiratory diseases, remittent fever, and debility. The mortality from pneumonia, remittent fever, dysentery, debility, and scurvy, was raised; while that from injuries, tubercle of the lungs, and diarrhœa was lowered. Dysentery caused 38 per cent. of the total deaths.

Sickness in the Burma jails increased, cholera having been prevalent. The constantly sick rate rose from 35 to 43 per 1,000 and the death-rate from 30·23 to 33·10. The chief causes of admission were ague, abscess, &c., eye diseases, dysentery, diarrhœa, and simple continued fever. The admission-rates from cholera, respiratory diseases, especially pneumonia, tubercle of the lungs, diseases of the integuments, and malarial fevers, were raised; while those from simple continued fevers, influenza, bowel complaints, and debility, were lowered. Ague caused 22 per cent. of the total sickness. The chief causes of death were cholera, dysentery, pneumonia, and tubercle of the lungs. The mortality from cholera, dysentery, pneumonia, tubercle of the lungs, and debility was raised; while that of remittent fever, respiratory diseases other than pneumonia, nervous diseases, circulatory diseases, diarrhœa, and scurvy was lowered. Cholera caused 27 per cent. of the total deaths, and dysentery 16 per cent.

The ratios of sickness and mortality show a considerable improvement in the health of the prisoners of Assam, even though cholera increased. The constantly sick rate fell from 70 to 52 per 1,000 and the death-rate from 66·91 to 62·79. The chief causes of admission were ague, diarrhœa, dysentery, abscess, &c., and respiratory diseases other than pneumonia. The admission-rates from influenza, cholera, circulatory diseases. respiratory diseases, spleen diseases, and eye diseases were raised; while those from scurvy, bowel complaints, and nervous diseases were lowered. Ague caused 42 per cent of the total sickness. The chief causes of death were dysentery, cholera, pneumonia, other respiratory diseases, and diarrhœa. The mortality from remittent fever, respiratory diseases, and cholera was raised; while that from bowel complaints, scurvy, and debility was lowered. Dysentery caused 26 per cent. of the total deaths, and cholera 16 per cent.

With the exception of a slight improvement in the admission-rate, from 1,134 per 1,000 to 1,122, the health of the prisoners of Bengal exhibited a falling of, as compared with that of the previous year, the death-rate having increased from 31·39 to 37·09 per 1,000. The chief causes of admission were ague, dysentery, diarrhœa, influenza, and "other fevers." The admission ratios from "other fevers," influenza, pneumonia, and eye diseases were raised; while those from simple continued fever, malarial fevers, spleen diseases, and debility were lowered. Ague caused 26 per cent. of the total sickness, and dysentery 19 per cent. The chief causes of death were dysentery, pneumonia, and cholera. The mortality from dysentery, cholera, and pneumonia was raised; while that from all fevers, except ague, and from diarrhœa, was lowered. Dysentery caused 26 per cent. of the total deaths, pneumonia 14 per cent., and cholera 11 per cent.

Notwithstanding a reduction of mortality from cholera and bowel complaints, the health of the prison population of the North-Western Provinces and Oudh showed a deterioration, in great part due to influenza, as compared with the present year. The constantly sick-rate rose from 34 to 41 per 1,000 and the death-rate from 27·83 to 29·07. The chief causes of admission were ague, influenza, abscess, &c., and dysentery. The admission ratios from influenza, ague, enteric fever, hepatitis, and abscess were raised; while those from cholera, small-pox, respiratory diseases, bowel complaints, spleen diseases, and debility were lowered. Ague caused 31 per cent. of the total sickness. The chief causes of death were dysentery and pneumonia. The mortality

from ague, tubercle of the lungs, and debility was raised; while that from cholera, respiratory diseases, and bowel complaints was lowered. Dysentery and pneumonia caused each 15 per cent. of the total deaths.

The health of the Punjab prisoners deteriorated, there being an increase of cholera mortality. The constantly sick-rate of 47 per 1,000 showed an increase of 7 on the rate of 1891 and the death-rate rose from 28·31 to 30·56. The chief causes of admission were ague, abscess, &c., diarrhœa, and dysentery. The admission-rates from ague, cholera, and bowel complaints were raised; while those from remittent fever, simple continued fever, guinea-worm, and respiratory diseases other than pneumonia were lowered. Ague caused 68 per cent. of the total admissions. The chief causes of death were pneumonia, dysentery, and cholera. The mortality from cholera, ague, pneumonia, and bowel complaints was raised; while that from remittent fever, enteric fever, and "other fevers" was lowered. Pneumonia caused 38 per cent. of the total deaths.

In the jails of the Bombay Presidency as a whole all the ratios compare unfavourably with those for the preceding year, except the death-rate from bowel complaints. The constantly sick rate rose from 27 to 31 per 1,000 and the death rate from 33·46 to 37·43. The chief causes of admission were ague, diarrhœa, and dysentery. The admission-rates from simple continued fever, malarial fevers, and bowel complaints were raised; while those from respiratory diseases, influenza, spleen diseases, and diseases of the integuments were lowered. Ague caused 39 per cent. of the total sickness. The chief causes of death were pneumonia, diarrhœa, dysentery, and debility. The mortality from nervous diseases, cholera, bowel complaints, and debility was raised; while that from heat-stroke, respiratory diseases, tubercle of the lungs, and injuries was lowered. Pneumonia caused 25 per cent. of the total deaths, and bowel complaints 24 per cent.

The health of the prisoners of Berar showed a decided falling off, though there was no cholera. The constantly sick rate (16) increased by 2 per 1,000 and the mortality (17·17) by nearly 6 per 1,000. The chief cause of admission was ague. The admission ratios from influenza and ague were raised; while those from bowel complaints, guinea-worm, and remittent fever were lowered. Ague caused 60 per cent. of the total sickness. The chief causes of death were circulatory diseases, dysentery, and injuries. The mortality from dysentery, injuries, nervous diseases, and circulatory diseases was raised; while that from debility, pneumonia, ague, and diarrhœa was lowered. Circulatory diseases, dysentery, and injuries caused each 19 per cent. of the total deaths, and nervous diseases 14 per cent.

In the jails of the Central Provinces sickness increased with a sudden rise in cholera mortality, the constantly sick-rate being 31 per 1,000 against 28 in 1891, and the death-rate 44·95 against 30·37. The chief causes of admission were ague, abscess, &c., dysentery, and diarrhœa. The admission-rates from influenza, cholera, remittent fever, simple continued fever, bowel complaints, and debility were raised; while those from "other fevers," tubercle of the lungs, and pneumonia were lowered. Ague caused 38 per cent. of the total sickness. The chief causes of death were dysentery, cholera, pneumonia, and debility. The mortality from cholera, debility, and dysentery was raised; while that from malarial fevers, diarrhœa, and nervous diseases was lowered. Dysentery caused 24 per cent. of the total deaths and cholera 22 per cent.

The increase of sickness from 24 to 29 per 1,000, and mortality from 38·25 to 51·20, among the prisoners of Madras, is attributed to cholera and bowel complaints, following food-scarcity in the Presidency. The chief causes of admissions were ague, diarrhœa, dysentery, debility, and abscess, &c. The admission rates from influenza, cholera, malarial fevers, respiratory diseases, dysentery, debility, and guinea-worm were raised, while those from eye diseases and diarrhœa were lowered. Bowel complaints caused 26 per cent. of the total sickness, and ague 15 per cent. The chief causes of deaths were cholera, dysentery, and diarrhœa. The mortality from cholera, dysentery, nervous diseases, circulatory diseases, tubercle of the lungs, and urinary diseases was raised; while that from fevers, diarrhœa, and debility was lowered. Cholera caused 38 per cent. of the total deaths and dysentery 21 per cent.

The following statement compares the geographical groups with their own past and with each other:—

		Ratio per 1,000 of Average Strength.												
		I. Burma Coast and Bay Islands.	II. Burma Inland.	III. Assam.	IV. Bengal and Orissa.	V. Gangetic Plain and Chutia Nagpur.	VI. Upper Sub-Himalayan.	VII. Indus Valley and North Western Rajputana.	VIII. South Eastern Rajputana, Central India, and Gujarat.	IX. Deccan.	X. Western Coast.	XI. Southern India.	XII. Hills.	India.
1882–91	Constantly sick	53·7	44·1	56·6	51·0	28·5	35·2	29·4	26·7	29·6	29·0	25·0	48·6	37·7
	Deaths—cholera	3·00	5·27	5·59	5·06	3·19	1·46	·09	1·71	3·50	·72	3·89	1·66	2·91
	Deaths—dysentery	7·01	5·88	13·37	14·48	6·78	5·05	2·62	2·79	7·51	4·73	3·87	9·05	6·84
1891	Constantly sick	51·7	29·5	68·3	41·9	33·0	36·4	36·0	34·7	27·1	25·1	22·6	47·4	36·9
	Deaths—cholera	2·70	·44	11·21	2·74	4·46	2·30	—	·45	·12	—	11·53	—	3·09
	Deaths—dysentery	9·13	4·21	17·33	7·54	5·97	3·48	3·07	1·79	3·82	5·86	3·80	13·53	5·74
1892	Constantly sick	56·3	31·0	51·7	43·9	38·0	43·1	39·4	48·7	33·0	29·2	26·9	34·3	41·4
	Deaths—cholera	2·80	12·06	10·54	2·65	3·01	1·38	2·45	1·77	5·27	11·93	19·01	—	4·73
	Deaths—dysentery	14·03	3 66	17·24	9·88	6·15	3·52	3·60	3·99	7·91	9·28	9·69	4·12	7·80

For the decennium 1882–91 Assam had the highest constantly sick rate, Southern India the lowest; Assam the highest death-rate from cholera, the Indus Valley the lowest; Bengal, and next to it Assam, the highest death-rate from dysentery, and the Indus Valley the lowest. In 1892 Groups VII., VIII., IX., X., and XI. compared altogether unfavourably with the past, Group XII. favourably, and Group IV. favourably with the decennium.

Of the 12 annual ratios of constantly sick, five were above the ratio for India, and seven below, the highest being that of Burma Coast, and the lowest that of Southern India. The highest admission rate was that of Assam, and the lowest that of Burma Inland. Burma Coast had the highest admission rates from respiratory diseases other than pneumonia, hepatic abscess, scurvy, and rheumatism, and the lowest from influenza; Burma Inland the highest from urinary and eye diseases; Assam the highest from diarrhœa, spleen diseases, and entozoa other than guinea-worm; Bengal-Orissa the highest from small-pox, remittent fever, simple continued fever, "other fevers," tubercle of the lungs, dysentery and hepatitis; the Upper Sub-Himalyan the highest from enteric fever and ague; the Indus Valley the highest from heat-stroke, pneumonia, and diseases of the integuments; Central India the highest from influenza; the Western Coast the highest from circulatory diseases; Southern India the highest from cholera, debility, and guinea-worm; the Hills the highest from nervous diseases and tonsillitis, and the lowest from cholera.

The highest death-rate was that of Assam, and the lowest that of the Hills. Burma Coast had the highest mortality from remittent fever, and the lowest from diarrhœa; Assam the highest from circulatory diseases, respiratory diseases other than pneumonia, dysentery, diarrhœa and injuries; Bengal-Orissa the highest from small-pox, ague, "other fevers," and tubercle of the lungs; the Upper Sub-Himalayan the lowest from dysentery; the Indus Valley the highest from heat-stroke, pneumonia, and sloughing; the Deccan the highest from hepatic abscess; Western Coast the highest from enteric fever, hepatitis, and scurvy; Southern India the highest from cholera and urinary diseases, and the lowest from remittent fevers; the Hills the highest from spleen diseases, and the lowest from cholera, tubercle of the lungs, pneumonia, and other respiratory diseases.

General Population.

Comparison of statistics of the different provinces.

The highest mean provincial birth-rates were recorded in Berar, 39·9, the Central Provinces, 38·39, and the Punjab, 38·16; in the remaining provinces the rates ranged from 36·17 in the North-Western Provinces and Oudh to 22·12 in Coorg and 17·88 in Mysore. The excess of male over female births varied from 13·87 per cent. in the Punjab to 3·99 per cent. in Coorg. In four provinces the number of deaths exceeded the number of births, the ratio of excess per 1,000 of the death-rate being, in the Punjab, 11·32, in Coorg, 8·49, in Bengal, 3·77, and in Assam, 3·16. In all the other provinces the birth-rate was higher than the death-rate, the excess per thousand

varying between 11·1 in Berar and 2·06 in the North-Western Provinces and Oudh, and 1·33 in Mysore.

The highest death-rates were registered in the Punjab 49·48, in Assam, 34·21, in the Central Provinces, 34·14, and in the North-Western Provinces and Oudh, 34·11; in the other provinces the rates ranged ranged from 32·50 in Bombay to 20 in Lower Burma and 16·55 in Mysore.

In all provinces, except the Central Provinces, where the rates per thousand were, urban 27·30 and rural 34·77, the urban death-rate was higher than the rural, the excess varying from ·72 in the North-Western Provinces and Oudh to 5·7 in Madras and 10·59 in Burma.

Fevers, as usual, caused the greatest mortality, indeed, in most provinces fevers caused more deaths than all other causes put together. The highest death-rate under this heading was 34·83 per 1,000 in the Punjab, and 24·90 in the North-Western Provinces and Oudh, the lowest 8·3 in Madras and 8·2 in Mysore. The cholera death-rates varied from 4·29 and 4·21 in Assam and the Central Provinces, respectively, to ·7 in Berar and ·33 in Coorg. By far the highest death-rate from small-pox was recorded in Coorg, where 5·27 per 1,000 died from this disease. In the other provinces the death-rates varied between 1·74 in Mysore and ·02 in Berar. The highest death-rates from dysentery and diarrhœa were recorded in Berar, 3·9, and in Assam, 3·12, the lowest in the North-Western Provinces and Oudh, ·90, and in Bengal, ·68.

The following statement shows the deaths from all causes, recorded month by month, in the different provinces :—

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratios of Deaths per 1,000 of Population.	
														1892.	1891.
Bengal - - -	189,124	191,517	254,822	207,117	217,907	156,776	148,849	185,183	148,705	163,111	204,330	179,804	2,247,275	31·92	26·94
Assam - - -	11,805	11,796	15,279	13,770	15,828	15,220	14,859	13,994	14,707	15,290	14,677	14,559	171,784	34·21	29·91
North-Western Provinces and Oudh.	118,254	101,747	135,673	174,597	192,819	145,560	110,577	104,021	129,534	141,988	128,015	117,268	1,600,053	34·11	31·14
Punjab - - -	63,733	51,182	52,918	56,966	82,973	72,726	56,220	52,846	110,499	192,971	136,423	87,531	1,017,923	49·48	29·13
Central Provinces - -	20,246	20,108	29,659	34,055	31,964	28,427	27,439	28,325	27,223	26,855	26,521	23,526	324,548	34·14	35·54
Berar - - -	6,255	5,926	9,133	8,987	5,533	3,705	4,809	6,627	8,408	8,458	8,180	6,103	82,124	28·8	40·6
Lower Burma - -	7,053	5,922	6,368	6,006	6,264	7,034	9,156	9,334	8,447	7,983	7,964	8,702	90,233	20·00	15·98
Madras Presidency -	86,870	61,728	63,765	56,483	56,550	53,643	74,465	73,693	58,689	53,479	54,259	57,131	750,755	22·3	26·2
Bombay Presidency -	69,044	45,142	49,156	41,729	41,517	44,243	60,342	51,979	48,023	51,317	60,052	49,198	611,742	32·50	27·26
Mysore - - -	6,238	6,314	6,926	7,977	8,094	6,987	6,821	6,370	6,220	5,972	6,273	5,957	80,149	16·55	14·03
Coorg - - -	469	437	446	362	394	522	514	544	476	428	354	353	5,299	30·62	21·79
Total - -	579,096	501,319	624,145	608,049	659,843	534,843	514,051	532,916	560,931	667,852	647,078	550,162	6,980,785	—	—

In Bengal, until the end of 1891, the registration of births was confined to selected towns, and was effected by municipal agency. Since the beginning of 1892 registration has been extended to all town and rural areas, and the work has been entrusted to the police. It is carried out as follows. Each *chowkidar* or village watchman is provided with a pocket-book, in which he is to record, or to have recorded by the *punchayet* of the village, if he is illiterate, all births and deaths which take place within his jurisdiction; these are reported on certain days at the police-stations and out-posts, which are the registering centres. The statistics thus obtained are checked from time to time by Inspecting Officers, including Magistrates, Sub-Divisional and Police Officers, the Sanitary Commissioner and his deputies, and the superior officials of the Vaccination Staff. If omissions are detected, the defaulting *chowkidar* is reprimanded or punished. So far the plan has worked very successfully, and the Sanitary Commissioner hopes that the backward position of Bengal as regards the registration of vital statistics will be speedily improved.

The population of Bengal, excluding Calcutta, the Chittagong Hill Tracts, and the Tributary Estates of Angul in Orissa, according to the Census Report of 1891, is 70,388,083, and among this population 1,981,960 births were registered, equivalent to a birth-rate of 28·15 per 1,000. The Sanitary Commissioner believes that these figures represent very imperfectly the real birth-rate, which is something over 40 per 1,000. The average birth-rate for rural circles was 28·27. In the towns the birth-rate was 25·31, the ratios varying from 47·71 in Siwan to 4·65 in Jhalukati. Of the

145 towns, in three the birth-rate was over 40 per 1,000, in 19 between 35 and 40, in 19 between 30 and 35, between 20 and 30 in 63, under 20 in 41, of which five returned a rate under 10 per 1,000. In certain of the towns the low rates may perhaps be, in part, due to an excess of males over females in the population, but it must be concluded that registration is defective in most of the towns showing a low rate. The proportion per cent. of male to female births in the province was 108, varying in the different divisions from 111 in the Presidency Division to 106 in Chota Nagpur.

In seven of the nine divisions there was recorded an excess of deaths over births, the registered excess in the province being 3·77 per 1,000. In the Chittagong Division the excess of births over deaths was 8·9, and in Chota Nagpur ·30 per 1,000. During the year 2,247,275 deaths were reported to have occurred, the death-rate being 31·92 per 1,000, against 26·94 in 1891. The average death-rate in districts, excluding towns, was 31·85, and varied from 43·88 in Backergunge to 19·12 in Singhbhum. In the towns the death-rate was 33·57, the ratios varying from 59·31 in Lalgunj in the district of Mozuffarpur, to 14·52 in Tangail in Mymensingh. The provincial death-rate among infants under one year of age was 168·29 per 1,000 of living, against 132·95 in 1891; and in children between one year and five years of age, 43·71 against 37·11 in the previous year. In Calcutta the death-rates among children under one year of age was 380·9, and among those between one year and four years, 47·9.

The population of the areas in Assam under registration was, according to the census of 1891, 5,021,084, and among this population in 1892 there were recorded 155,909 births, 12,361 in excess of the number registered in the previous year. The birth-rate was 31·05 against 28·59 in 1891. This rate is slightly lower than the rates recorded in 1888 and 1889, but as it is calculated on the greater population obtained by the census of 1891, it is, as the Sanitary Commissioner notes, really the highest on record. In the districts the ratios per 1,000 varied from 37·06 in Goalpara to 22·09 in Nowgong. The average birth-rate in the Surma Valley was 33·79, in the Assam Valley it was 28·36, and in the selected areas of the Khasi and Jaintia Hills 24·14. The mean birth-rate in town registration circles was 19·67, in rural circles it was 31·30. In the *sadar* towns the ratio of births per 1,000 of the population was 17·83, the highest ratio, 34·12, being recorded in Dibrugarh, and the lowest, 6·21, in Dhubri. The provincial average number of males born for every 100 females born was 107, the figures varying from 112 in Kamrup and in Darrang to 104 in Cachar.

The number of deaths rose from 150,156 in 1891 to 171,784 in the year under review, against 127,315, the average of the five years 1886 to 1890. The death-rate in 1892 was 34·21 per 1,000 against 29·91 in the previous year. In the province generally the death-rate exceeded the registered birth-rate by 3·16 per 1,000 of the population. In the Darrang district the excess of deaths over births registered was 14·46 per 1,000, in Kamrup the excess was 10·42, and in Nowgong 7·74; in two districts only did the recorded birth-rate exceed the death-rate, namely, Goalpara and Sylhet, where the ratios of excess were 2·04 and ·26 per 1,000 respectively. Of the districts the highest death-rate was recorded in Darrang 41·41, and the lowest, in Sibsagar, 26·68. In the Surma Valley the death-rate was 34·33, in the Assam Valley it was 34·22, and in selected areas of the Khasi and Jaintia Hills, 28·11. In town circles the average death-rate was 38·80, and in rural circles 34·11. In the *sadar* towns the average death-rate was 40·96, including deaths in the dispensaries, but if these deaths are excluded, the rate was 26·45. Including deaths in the dispensaries, the highest death-rate registered was 80·78 in Tezpur, and the lowest 12·65 in Shillong. Between the ages of 10 and 30 the death-rate of females was higher than that of males; between the ages of 30 and 40 the death-rates of the sexes were equal, while at all other age-periods the male rates were the higher. Excluding the Khasi and Jaintia Hills, the death-ratios per 1,000 living among infants under one year of age were 179·85 and 161·82 for males and females respectively, the ratios for children over one year and under five years being 39·29 for males and 37·89 for females.

In the North-Western Provinces and Oudh the number of births registered was 1,696,427, an increase of 136,539 over the figure of 1891. The birth-rate was 36·17 per 1,000, compared with 38·18, the corrected decennial average. In 11 districts birth-rates of 40 per 1,000 and over were recorded. The highest district-rate was returned from Moradabad, 46·35, and the lowest from Ghazipur, 26·45, and Dehra Dun, 20·45. The average birth-rate in municipal towns was 34·94, and, among the larger, ranged from 45·70 in Koil (Aligarh) to 25·17 in Bareilly. Among the smaller municipalities the highest rate was 51·40 per 1,000, recorded in Khairabad, and high rates over 50 per 1,000 were returned from Amroha, Tilhar, Ujhani, and Sahaswan.

The lowest rates, 20·97 and 13·89, were registered in Bela and Dehra respectively. In the province as a whole the percentage of male to female births was 110·3.

The total number of deaths recorded was 1,600,053, less than the total number of births by 96,374, and the death-rate was 34·11, against 31·14 in 1891, and 31·66, the corrected average of the decennium 1881 to 1890. In the districts the highest death-rate, 52·35, was recorded in Naini Tal, including the Terai and Bhabar, and very high death-rates were registered in Dehra Dun, 43·35, Garhwal, 45·34, and Almora, 48·47, due to the great prevalence of cholera in the Hill Tracts. The lowest rate, 23·13, was returned from Ghazipur. In the municipal towns the average death-rate was 34·82 per 1,000, compared with 36·51 in 1891, which was on the whole the healthier year. Among the larger municipalities, the highest rate of mortality was recorded, as in the previous year, in Fyzabad, but it was only 43·09 against 52·62 in 1891. The lowest rate was 17·69, recorded in Bareilly, which the Sanitary Commissioner remarks, "is obviously incorrect." Of the minor municipalities, in nine rates were recorded in excess of 50 per 1,000, the highest being 57·06, in Baghpat, in the Meerut district. The increase in the provincial death-rate, as will be seen, has coincided with a notable diminution of the urban mortality—a result doubtless due, as indicated by the Sanitary Commissioner, to the extensive sanitary works which have been carried out in the towns. There was a rise in the death-rate of infants corresponding with the increase of the general mortality during the year. The rate was 219·5 per 1,000, which is yet 18·9 under the decennial average. The death-rates per 1,000 of children between one and five years of age were 57·01 and 53·74 for males and females respectively. During all age periods, except from 15 to 30, the death-rates of males were higher than those of females.

There were 784,356 births registered in the Punjab during the year; calculated upon the population, according to the census of 1891, the birth-rate was 38·16 per 1,000. This shows a considerable increase over last year's rate, 34·02, and over the average of the previous five years which, calculated on the same population, was 35·76; indeed, with the exception of 1884, more births were registered in the province in 1892 than in any year since registration was begun. The Sanitary Commissioner attributes the improved birth-rate in part to greater accuracy in registration, but in a measure also to the fact that the year 1891 was fairly healthy. Among the districts Sialkot as usual returns the highest birth-rate, 50·80 per 1,000, the districts of Gujranwala and Gurdaspur came next with 46·53 and 46·17 respectively, while in accordance with the experience of past years the lowest birth-rates were registered in the frontier districts and in Simla. During the last five years the highest birth-rates have on an average been recorded in the districts of Sialkot, Gurdaspur, Jullundur, Amritsar, and Gujranwala; and in these districts the infant mortality is above the provincial average. The same peculiarity is to be observed in the irrigated villages of the Delhi district. The Sanitary Commissioner suggests, as an explanation, that where a high infant mortality prevails, mothers cannot as a rule nurse children for two or three years, and so bear children at shorter intervals of time. In the municipal towns the average birth-rate was 38·68 per 1,000, the highest rate, 51, being recorded in Kaithal, and the lowest, 25, in Sadhaura in the Umballa District. There were 113·87 male births registered for every 100 female in the province as a whole, and as usual the excess of male births was greatest in the frontier districts, Peshawar leading with 154·35 boys to 100 girls. In the province generally the death-rate exceeded the birth-rate by 11·32 per 1,000, and in all but two districts the number of deaths was greater than the number of births. The exceptions were Gurgaon and Jullunder, where the excess of the birth over the death-rates was only ·71 and ·23 per 1,000 respectively.

Excluding such as occurred among Europeans and Eurasians, and in military cantonments, there were registered in the province 1,017,023 deaths, the rate calculated on the census figures of 1891 being 49·48 per 1,000. This death-rate is the highest on record; it is 20·35 per 1,000 higher than the rate of 1891, and 18·44 per 1,000 higher than the average rate of the years 1886-90, calculated on the same population. With the single exception of Simla, the registered death-rate was higher in every district than the average of the previous five years. In the eastern districts the mortality was somewhat above the average, in the midland districts the excess over the average was greater, and in the western districts the death-rate was more than twice the average of the previous quinquennium. The highest death-rate was registered in the district of Bannu, and was 66·69 per 1,000; the next in order were Gurdaspur (63·18), Sialkot (62·44), Montgomery (57·85), Shahpur (56·58), and Multan (56·38). The lowest death-rate was recorded in the Simla district, 23·01 per 1,000, the next lowest being returned from Rohtak (36·97), and Dera Ghaz Khan (38·45). The average death-rate in the

municipal towns was 54·22, the highest 90 per 1,000, and the lowest 36 per 1,000, being returned from Tanda *cum* Urmar and Kartarpur, in the Jullundur district, respectively.

The abnormal mortality in the province was due to excessive outbreaks of cholera, fever, and influenza. In the Punjab, ordinarily, the highest percentage of deaths occurs in October; this was especially the case in the year under review, the percentage of the total deaths recorded in this month being 19·0 against 13·4, the average percentage of the total mortality recorded for October in the previous 11 years. The death-rate among females exceeded the death-rate among males by 2·55 per 1,000. In infancy, and in the age-periods between 40 and 60, the death-rates of males were higher than those of females. In all other age-periods the death-rates of females were higher. As might be expected in this exceptionally unhealthy year, the mortality among the infant population was very high, and the deaths of 117,418 male and of 110,536 female infants were recorded. If these figures are calculated on the number of male and female children born during the year, the death-rates are found to be 281·16 and 301·40 for males and females respectively. The Sanitary Commissioner remarks: "It is well known that female infants are not so well clothed and looked after "in other respects as male infants are, and it is therefore probable that considerably "more female infants fell victims to disease in the very unhealthy year, 1892, than the "better cared for male infants."

In 1881 the total population of the registration circles in the Central Provinces was 8,817,185; in 1891 it was 9,501,401, showing an increase of 7·76 per cent. The number of births registered in 1892 was 364,745, and the birth-rate, the lowest since 1886, was 38·39 per 1,000. The districts of Damoh, Murwara, Nimar, Betul, Chhindwara, and Wardha returned birth-rates of 40·00 per 1,000 and over, the highest rate being in Chhindwara, where it was 45·03. The lowest birth-rate was registered in the Berhampur district, 34·79 per 1,000. In the *sadar* towns the average birth-rate was 26·63. For the whole province the excess of male over female births was 6·95 per cent., the highest ratio being 16·27, recorded in the Berhampur district, the lowest 3·32 in Bilaspur. In three districts, Raipur, Bilaspur, and Sambalpur, the deaths exceeded the births; this was due to the prevalence of cholera. In the remaining 17 districts the births were in excess, the highest ratio of excess, 20·45 per 1,000, being in Chhindwara. The number of deaths registered was 324,348, a larger number than in any of the last ten years except in 1889, when 386,155 were recorded. The death-rate was 34·14 against 32·98 in 1891, calculated on the census figures of that year. Of the districts Raipur had the heaviest death-rate, 46·66 per 1,000, and the registered death-rate was lowest in the Chhindwara district, 24·58. In the *sadar* towns the average death-rate was 27·02. The percentage of deaths of infants to the total deaths registered was 29 against 30 in 1891. Among Muhammadans the ratio of deaths per 1,000 of population was 28·67; among Hindus 30·47, and among other classes 55·67.

In Berar the total number of births registered in 1892 was 113,640, or 8,115 less than in the previous year, and the birth-rate was 39·9 against 42·8. There was a decrease of births in all districts. The highest rate, 43·7, was recorded in the Akola district; Basim, with 36·5, and Wun, with 33·1, come next. Of the towns, Wadegaon had the highest birth-rate, 52·1, and Basim the lowest, 26·0. In the case of the latter the Sanitary Commissioner indicates how faulty the registration of births is—of 20 children born during the year, selected by him, ten had not been registered. The proportion of male to female births was 104·6 to 100. The proportion of still births to live births was 4·2 per cent., made up of 2·5 per cent. males and 1·7 per cent. females. There were 82,124 deaths registered during the year, the death-rate being 28·8 per 1,000 of the population. For every 100 females that died, 112·6 male deaths were recorded. In the districts the death-rate ranged from 33·2 in Ellichpur to 24·0 in Wun. Among the towns the highest mortality was registered in Balapur, 44·1; in Hiwarkhed and Pusad also were recorded death-rates over 40 per 1,000, and in Barsi Takli, Pathrot, and Kholapur the rates were high. In these towns the chief causes of death were fevers and bowel complaints, the results of their insanitary surroundings and impure water-supply.

In the Presidency of Bombay, including Sind, there were registered 650,667 births, a less number by 32,010 than that recorded in 1891. The birth-rate for 1892 was 34·57 per 1,000, against 36·27 in the previous year, and a mean of 35·16 for the preceding ten years. The highest rate was recorded in the Southern registration district, 38·43, and the lowest, 23·41, in Sind, where registration is stated to be defective. Of the 24 collectorates, in five, Nasik, Thana, Kolaba, Ratnagiri, and Kanara, the recorded births were more numerous in 1892 than in 1891, in each of the

remainder there was a decrease. The recorded birth-rates among the urban and rural populations were respectively 28·24 and 35·46, against 28·63 and 37·34 in 1891. In most of the collectorates the birth-rate was higher among the rural than among the urban population, but in five collectorates (four of which are in Sind), viz., Karachi, Hyderabad, Thar and Parkar, Shikarpur, and Ratnagiri, the urban rate was much higher than the rural. Of the rural registration circles, in ten the recorded birth-rate was above 50 per 1,000; in 61 between 40 and 50; in 86 between 30 and 40; in 40 between 20 and 30, and in 25 it was below 20. Of the last 25 circles 22 are in Sind. Of the 56 towns in the Presidency, 14 had a birth-rate exceeding 40, and in five, namely, Broach, Jacobabad, Bombay, Mahad, and Thana, rates under 20 per 1,000 were recorded. The ratios ranged from 53·85 in Vengurla to 16·67 in Thana. For every 100 female births 107·54 male births were registered, but in the city of Bombay, in Kanara, Kaira, and Ahmedabad, the proportion of male births was somewhat higher, and in the collectorates of the Sind registration district, much higher. In the whole Presidency the percentage of still-born children was 0 98; in the city of Bombay 9·32, and in Kanara 4·68.

The death-rate was 32·50 against 27·26 in 1891, the recorded number of deaths being 611,742 in 1892, against 513,132 in the previous year. The highest rate, 40·03 per 1,000, was returned from the Gujrat, and the lowest, 28·12, from the Central, registration district. Of the collectorates, the highest rate, 47·51, was recorded in Ahmedabad, and the lowest, 20·93, in Ratnagiri. The recorded death-rates among the urban and rural populations were respectively 36·13 and 32·00 per 1,000, against 29·45 and 26·96 in 1891. Of the *talukas* or rural registration circles, 42 recorded a death-rate over 40 per 1,000; 90 between 30 and 40; 77 between 20 and 30, whilst in 13 the death-rate was under 20. The death-rates in the towns varied from 63·82 in Umarkot to 16·60 in Karwar. The rates of deaths of infants under one year of age, per 1,000 living, were 190·20 and 166·86 for males and females respectively, and the ratios for male and females over one year and under five were 60·96 and 56·43. Between the ages of 10 and 40 the female death-rate was higher than the male; for all other ages the male death-rate was the higher.

In Madras, in 1891, there were registered 924,238 births, in 1892 the number was 845,029, showing a decrease of 79,209. Last year the birth-rate was reported to be 32·4 per 1,000, but this was calculated on the census figures of 1881; adopting the figures of 1891 the rate is reduced to 27·4. In 1892 the birth-rate was only 25·1 per 1,000. The low birth-rate in Madras is of course in part due to defective registration, but the contention of the Sanitary Commissioner, that the diminution was due to the prevailing scarcity, is borne out by the fact that the diminution was greatest where the distress was most severely felt. In all the districts, except South Canara and the Nilgiris, the birth-rates were lower than the average of the previous 10 years. In 19 districts the rates were lower than in 1891; in the remaining three, Godavari, South Canara, and Tinnevelly, they were somewhat higher. In no district was the birth-rate above 36·8 per 1,000; in four only was it above 30; in 17 it was between 20 and 30; and in one district, Ganjam, it was below 20 per 1,000. The highest birth-rates were recorded for the districts of Madras (36·8), and Bellary (32·5); the lowest for Malabar (20·4), and Ganjam (17·8). Of the rural registration circles, from one a birth-rate was returned of over 40 per 1,000, and from 36, rates ranging from 30 to 40. In 115 the rates were between 20 and 30, and in 27 below 20 per 1,000. In the 55 municipal towns the average birth-rate was 29·9 per 1,000, the rates ranging from a maximum of 41·3 in Vaniyambadi to minima of 20·9 in Vizianagram and Trichinopoly. In only two towns were the birth-rates over 40 per 1,000 of the population, from 33 rates were returned between 30 and 40, and from 20 between 20 and 30. In the Presidency for every 100 female births registered there were recorded the births of 104 males. As in past years, the total number of births exceeded the total number of deaths, but in 1892 the excess was at the rate of only 2·8 per 1,000 of the population. In seven districts more deaths than births were registered, the greatest excess of death over birth-rates being in the districts of Madras and Godavari.

The total number of deaths recorded was 750,755, giving a death-rate of 22·3 per 1,000 against 22·2 in 1891—a higher death-rate than in any year since 1878. The highest death-rate was recorded in Madras, 46·5, a marked decrease as compared with last year when the rate was 53·1. The next highest death-rate was 35·1 in the Kurnool district, where fevers were very prevalent, and the lowest death-rate, 14·3, was returned from the district of Ganjam, where, however, registration is very imperfectly carried out. In five registration circles death-rates above 40 per 1,000 were recorded, in 20 the rates were between 30 and 40, in 87 between 20 and 30, and in 67 below 20.

The average death-rate of the municipal towns was 29·4 per 1,000, or 7·5 higher than the district rate. The ratios varied from 55·2 in Kurnool, where cholera and fever were rife, to 18·2 in Salem. The death-rate among infants under one year of age was 173·9 per 1,000, calculated on the number born during the year.

In Coorg the number of births registered was 3,829, giving a ratio of 22·12 per 1,000 against 20·31 in 1891. The proportion of males to every 100 females born was 103·99. As is usually the case, the death-rate exceeded the birth-rate, the excess this year being 8·49 per 1,000 of the population. The deaths registered aggregated 5,299, and the death-rate per 1,000 was 30·62, compared with 21·79 in 1891, and 21·77, the mean ratio of the previous five years. The number of deaths amongst males, compared with the number of deaths amongst females, was as 126·84 to 100. In Mercara, the only considerable town in the province, the death-rate was 31·98 against 20·04 in 1891.

The total number of births registered in Lower Burma was 112,070, and the birth-rate per 1,000 of the population was 24·83 against 20·74 in 1891, and 22·15, the mean ratio of the previous five years. The ratios range from 37·44 in the Sandoway district to 18·36 in Shwegyin. Although registration in the districts is very defective, there has apparently been improvement in all except Tharrawaddy and Mergui. In the towns, however, little or no improvement can be recorded, for in 12 out of the 25 municipal towns containing populations of 5,000 and over, the results were worse than in 1891. The average birth-rate for the towns was 21·80; the ratios varying between 49·92 recorded in Myanaung, and 15·59 in Rangoon. In all districts, except Sandoway, there was an excess of male births, and taking the province as a whole, 107 males were born for every 100 females. The births exceeded the deaths in the ratio of 5 per 1,000 of the entire population; but in the Hanthawaddy and Akyab districts the deaths were in excess of the births,—a result mainly induced by the preponderance of the male sex among the large population of Indian immigrants in the towns of Rangoon and Akyab in these districts. The deaths numbered 90,233, and the death-rate was 20·00 per 1,000 against 15·93 in 1891, and 18·00 the average of the previous five years. The highest district rate was 29·91, recorded in Akyab, the lowest, 12·55, in Tavoy. In the towns the average death-rate was 29·31, and the rates varied from 38·80 in Paungde to 12·99 in Zalun. In the province, as a whole, the percentage of male to female deaths recorded was 128. In 1892 the seasonal distribution of mortality corresponded fairly closely with the experience of former years, the heaviest mortality occurring during the rains and the lightest during the hottest months. The death-rates among infants under one year of age were 181·01 and 126·93 per 1,000 for males and females respectively; among children over one year and under five years of age the rates were 27·66 for boys and 23·50 for girls. At all age-periods, except between 20 and 30, the male death-rates were the higher.

History of Chief Diseases.

Cholera.

The total number of deaths due to cholera, recorded in India during 1891, was 601,603; and it was observed in the report for that year that this was the highest figure in any year since 1877, when there were 635,977 deaths from this cause. In 1892, however, cholera prevailed with greater intensity than in either of those years, and the number of deaths due to it was 762,695. The following table shows that, excepting Madras, Assam, Berar, and the Native States of Central India and Hyderabad, every province participated in this increase as compared with 1891, and that the excess was most marked in the Punjab, Rajputana, Bombay, Mysore, and Lower Burma. A comparison of the mortality in individual provinces from 1877 to 1892 shows that in Bengal, Punjab, Rajputana, Mysore, and Coorg, the number of recorded deaths from cholera was never so great as in 1892.

Statement showing the Deaths from Cholera in the different Provinces in India from 1877 *to* 1892.

Year.	Bengal.*	Assam.	North-Western Provinces and Oudh.	Punjab.	Central Provinces.	Berar.	Rajputana.	Central India.	Bombay.	Hyderabad.	Madras.	Mysore.	Coorg.	Lower Burma.
1877 - -	155,305	11,377	31,770	29	3,418	842	60	926	57,228	7,414	657,439	2,902	†	7,276
1878 - -	95,192	6,732	22,224	215	40,985	34,306	2,393	8,047	46,749	6,696	47,167	723	49	6,759
1879 - -	136,363	17,415	35,892	26,135	27,575	225	918	2,734	6,937	6	13,296	14	—	1,828
1880 - -	39,643	2,803	71,546	274	330	1	—	293	684	—	613	25	—	2,638

* Excluding Calcutta.

† Statistics not available.

Year.	Bengal.*	Assam.	North-Western Provinces and Oudh.	Punjab.	Central Provinces.	Berar.	Rajputana.	Central India.	Bombay.	Hyderabad.	Madras.	Mysore.	Coorg.	Lower Burma.
1881 - -	79,180	5,010	25,365	5,207	9,140	3,401	197	581	16,691	1,721	9,496	25	3	5,239
1882 - -	182,352	21,055	89,372	39	11,032	3,573	1,327	1,562	7,904	150	23,604	893	31	7,177
1883 - -	90,439	14,908	18,160	190	16,235	27,897	797	1,740	37,954	1,947	36,284	124	—	2,185
1884 - -	134,421	22,276	30,143	614	119	87	1,297	1,013	13,804	2,479	75,476	330	—	5,515
1885 - -	173,767	7,753	63,457	1,936	21,868	3,683	1,615	4,624	37,287	1,387	58,109	2,677	—	7,685
1886 - -	118,368	20,188	34,565	12	16,679	976	173	290	167	499	12,417	10	—	4,027
1887 - -	172,578	7,941	209,623	8,804	12,576	14,396	2,612	8,868	25,711	2,831	28,359	832	3	2,649
1888 - -	111,391	9,693	13,704	14,938	921	305	32	191	36,500†	2,057	58,677	1,915	2	15,982
1889 - -	171,103	18,288	48,494	2,833	52,588	10,925	6,923	3,344	32,431	1,128	76,020	1,590	9	3,240
1890 - -	145,885	15,396	80,295	3,401	4,787	847	2,746	3,132	3,259	—	35,288	1,326	5	1,076
1891 - -	229,575	23,882	169,013	10,107	21,312	7,958	2,946	13,474	17,850	3,102	98,773	1,204	7	2,400
1892 - -	259,398	21,552	194,886	75,959	39,972	2,030	26,760	8,334	42,900	58	79,033	5,497	58	6,208

* Excluding Calcutta.

† Including four deaths, the monthly distribution of which is not known.

As will be seen from the following statement the disease showed signs of slight subsidence in February; but from March it began to prevail with increasing severity until it reached its highest point in May, thereafter it began to decline steadily, and was at a minimum in December.

Statement showing the Deaths from Cholera registered in the different Provinces by months, during the year 1892.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Ratio of Deaths per 1,000 of Population. 1892.	1891.
Bengal - - -	11,362	11,140	31,235	39,725	56,280	37,593	25,629	18,345	4,687	3,168	10,559	9,675	259,398	3·68	3·26
Assam - - -	721	1,013	1,887	2,279	2,509	2,209	1,316	773	1,750	1,960	2,392	2,743	21,552	4·29	4·76
North-Western Provinces and Oudh.	949	697	3,437	31,913	58,087	39,066	19,155	9,923	12,587	13,982	4,193	897	194,886	4·15	3·60
Punjab - - -	60	18	58	6,834	25,252	21,203	11,265	5,444	4,613	1,116	96	—	75,959	3·70	0·49
Central Provinces - -	4	148	2,128	5,887	8,474	10,170	7,538	3,968	1,218	312	117	8	39,972	4·21	2·42
Berar - - -	—	—	—	37	263	157	277	402	431	309	139	15	2,030	0·7	2·8
Lower Burma - -	459	522	678	858	794	527	824	588	476	245	132	105	6,208	1 38	0·52
Madras Presidency -	18,676	6,874	4,601	3,652	4,417	5,957	16,739	13,003	3,462	876	490	286	79,033	2·3	3·5
Bombay Presidency -	666	1,008	1,672	3,078	6,050	8,089	14,694	5,238	1,562	436	215	192	42,900	2·28	0·95
Mysore - - -	104	208	393	1,818	1,753	664	275	126	24	52	71	9	5,497	1·13	0·25
Coorg - - -	—	—	—	7	6	—	—	18	23	3	1	—	58	0·33	0·04
Total - -	33,001	21,628	46,089	96,088	163,885	125,635	97,712	57,828	30,833	22,459	18,405	13,930	727,493	—	—

The severity of the disease in the different provinces, and its relative prevalence in the urban and rural circles, together with information under other heads, are shown in the subjoined table:—

Province.	Mortality in 1892.	Mean Mortality of previous Five Years.	Urban Mortality.	Rural Mortality.	Per cent. of Villages attacked.	Maximum Mortality in any one Rural Circle.	Maximum Mortality in any one Town.	Month of Maximum Prevalence.
Bengal - -	3·68	2·34	5·05	3·62	10·7	15·00	21·05	May.
Assam - -	4·29	3·0	4·53	4·29	18·1	7·45	24·18	December.
North-Western Provinces and Oudh.	4·15	2·29	1·99	4·31	18·2	19·32	60·08	May.
Punjab - -	3·70	0·39	2·90	3·76	18·2	11·36	10·89	May.
Central Provinces -	4·21	2·05	1·47	4·46	10·7	13·66	16·76	June.
Berar - -	·7	2·4	1·3	·6	2·5	1·3	16·0	September.
Lower Burma - -	1·38	1·36	2·28	1·25	8·6	3·42	11·14	April.
Madras - -	2·3	1·8	3·2	2·3	17·5	6·6	36·1	January.
Bombay - -	2·28	1·38	1·88	2·34	12·2	9·54	12·11	July.

Compared with the mean mortality of the preceding five years the death-rates in 1892 were greater in all the provinces with the exception of Berar. In Bengal, Assam, Berar, Lower Burma, and Madras, the town mortality was greater than that which occurred among the rural population, while in the remaining four provinces the case was just the reverse; in the North-Western Provinces and Oudh and the Central Provinces the excess of rural mortality was very marked. The disease was most widespread in Assam, the North-Western Provinces and Oudh, the Punjab and Madras, whereas in Berar it was confined to a very limited area. Excepting Bengal, the North-Western Provinces and Oudh, and the Punjab, in all of which the maximum mortality occurred in May, in all the other provinces the months when the mortality was greatest varied.

In Bengal, in 1892, there were registered as due to cholera 259,398 deaths against 229,575 in 1891, and 165,172 the average of the five years 1887–91. The death-rate in 1892 was 3·68 per 1,000 of the population, ·42 in excess of the rate of the previous year, and 1·34 above the average of the quinquennium 1887–91. In spite of this apparent increase, the Sanitary Commissioner does not consider that cholera was more prevalent in the year under review than in 1891, but ascribes the seemingly higher mortality to improved registration. Of the nine divisions Orissa suffered most, and Rajshahi least, the death-rates being respectively 12·09 and ·68 per 1,000. As in 1891, the disease was present in every district in every month of the year; the greatest mortality occurred in Balasore, where 15·00 per 1,000 of the population died of cholera, and the least in Purnea, where the death-rate was ·14. The average mortality of the district population was 3·62 per 1,000. The urban population suffered more than the rural, the average death-rate for the towns being 5·05 per 1,000. In four towns, Dinajpur, Muktagachha, Sherpur, and Kishengunj, no death from cholera was recorded, in the others the death-rates ranged from 21·05 in Raniganj and 16·49 in Puri to ·13 in Purnea and ·07 in Rangpur.

The period of the heaviest incidence of the disease in the province as a whole was from March to June. The first five months of the year were practically rainless, and the temperature was above the normal, as results of these conditions there was a progressive deterioration of the supply of drinking water, scarcity of food, and consequent lowered vitality of the people. The cholera mortality advanced from the beginning of the year and reached its maximum in May; receding with the onset of the rains to a minimum in October, it rose again rapidly in November. The rise after the cessation of the rains, was, in the opinion of the Sanitary Commissioner, due to lowering of the subsoil water.

The most remarkable facts concerning the distribution of the disease in Bengal during the year were these:—Balasore, Puri, and Cuttack, which were comparatively free from cholera in 1891, suffered terribly in 1892, while Purnea, Jalpaiguri, and Rangpur, in which cholera was most prevalent in the former year, enjoyed a remarkable immunity in the latter. The causes which apparently led to the great severity of the disease in Orissa were identical with, but greater in degree than, those which determined its prevalence in the province generally. Drought in October of 1891, failure of the winter rains, and a rainless spring, resulted in an unprecedented scarcity of water. When to this is added the effects of the severe cyclone which swept over the country in November 1891, we have those conditions which are favourable to the prevalence of cholera; exposure, scarcity of food, and a deficient and extremely polluted supply of water. In his interesting note regarding the condition of affairs in Balasore, the Magistrate, Mr. Cornish, writes:—

"The outbreaks are far too simultaneous and widespread, and occur at too great a distance from the pilgrim routes to allow us to attribute them to the passage of pilgrims. As to the immediate cause, I cannot do better than repeat what I wrote three years ago. In their eagerness to save the winter rice imperilled by the October drought the raiyats everywhere use for irrigation purposes every available drop of water, with the result that by February there is little left for drinking purposes. In the year under report January, February, March, April, and two-thirds of May were, with the exception of one extremely local storm at Bhadrak, practically rainless. Tanks failed, streams went dry, and cholera was universal. As usual, Jelasore with its good supply of Subarnarekha water suffered least."

In the port of Calcutta, in 1892, the average number of European seamen was 2,133; there were 12 cases of cholera, and seven died. The ratio of deaths per 1,000 was 3·28, the lowest on record.

In Assam the total registered mortality from cholera was less than in the previous year, the number of deaths being 21,552 in 1892, and 23,882 in 1891, and the death-

rates 4·29 and 4·76 respectively, against 2·84 in the quinquennial period 1886–90. There was an increase, compared with 1891, in the recorded number of fatal cases in the Kamrup, Sylhet, Sibsagar, Lakhimpur and Khasi and Jaintia Hills districts; in the remaining districts there was a decrease. In the Surma and Assam Valleys deaths occurred in every month in the year, the disease in the former was most prevalent from September until the end of the year, especially in December; in the latter it was most severe from March to July. Of the *sadar* towns Tezpur, Silchar, and Gauhati, in the order given, were most severely affected. In Shillong only one death from cholera was recorded.

The total number of immigrants into the Province of Assam during the year was 56,050. Of these, 19,916 went to the Surma Valley, and 36,134 to the Assam Valley, a percentage increase over the figures of 1891 of 14·00 and 11·39 respectively. No special explanation of the increase is given, but it was probably due to the opening out of new gardens and extension of cultivation. From the recruiting districts 25,421 immigrants for the Assam Valley started for Dhubri. Of these 11,768 travelled *viâ* Goalundo and 13,308 by way of Kaunia-Jatrapur, 47 died *en route*, and 259 were detained on account of sickness. The number of labourers and dependents despatched from Dhubri was 24,517, of whom 62 died on their way to the gardens. Besides these, 11,296 immigrants were shipped at Goalundo for gardens in the Assam Valley, amongst whom 20 deaths occurred between Goalundo and Dhubri; three between Dhubri and Gauhati; 15 between Gauhati and Tezpur; and 13 between Tezpur and Dibrugarh. The total numbers of casualties among immigrants during their passage through the Assam Valley, were, at Dhubri 70, of which 59 were due to cholera; on board steamers 62, including 48 cholera deaths; and at the various ports of debarkation 126 persons died of cholera, and 20 from all other causes. The total number of deaths from cholera were 233 against 83 in 1891. Regarding the immigrants into the Surma Valley the sources of information were less complete, and the following figures refer only to coolies imported under the Act, who passed through the depôts. For Cachar 3,457 coolies left Goalundo, of whom 64 died, 29 *en route*, and 35 in hospital. For Sylhet 2,399 left Goalundo, one died *en route*, and 10 in hospital. Of the total number of deaths, 54 in the case of Cachar, and 10 in the case of Sylhet, were due to cholera.

The exceptionally high mortality from cholera in the North-Western Provinces and Oudh in December of 1891 indicated the probable recrudescence of the disease in the spring of 1892. This indication was fulfilled, and the number of deaths registered reached the high figure of 194,886. In the two previous great epidemics the numbers of deaths recorded were 169,013 in 1891, and 200,628 in 1887; the death-rates per 1,000 of the population for the three years being 4·15, 3·60, and 4·54 respectively. In the epidemics of 1891 and 1887 the highest monthly mortality occurred in June, in 1892 the maximum was in May, when 58,087 deaths were registered, considerably the highest number recorded as due to cholera, in these provinces, in any one month. The mortality was exceptional in Dehra Dun and in the hill tracts of Garhwal and Almora. In Dehra Dun the death-rate was 18·13 per 1,000, in Garhwal 14·57, and in Bahraich 13·80. The cholera mortality was also exceptional in Bara Banki (12·71), Almora (12·40), Gonda (11·16), and Sitapur (10·08). There was excessive mortality in the districts of Partabgarh, Basti, Fyzabad, Kheri, Pilibhit, Sultanpur, and Hardoi, where the death-rates ranged from 8·97 to 5·02, and in the Tarai and hill tract, including the district of Naini Tal, the death-rate was 7·07. In Ghazipur the mortality was one per 1,000, and in the districts of Muttra, Muzaffarnagar, Cawnpore, Farukhabad, Etah, Etawah, and Saharanpur it was less. The municipal towns, on the whole, enjoyed a marked immunity from the disease, and the ratio of mortality in the towns of the province was 1·99 compared with 4·31 the rural, and 4·15 the provincial ratios. In the towns having a population over 40,000, the death-rate from cholera ranged from 3·53 in Fyzabad and Ajudhia and 2·29 in Benares, to ·33 in Agra and ·23 in Farukhabad. In some of the minor towns, however, the death-rate from cholera was most excessive, and in a non-municipal town of the Sitapur district called Laharpur, with a population of 11,452, the death-rate from cholera was 60·08 per 1,000, in Balrampur it was 15·69 and in Rudauli, in the Bara Banki district, it was 8·58.

At the *Magh mela* at Allahabad, in January, there was no cholera, and only three deaths from the disease were recorded in the whole district of Allahabad during the month.

For five years in succession cholera had appeared in the Punjab in epidemic form, and in 1892, the sixth year, there raged an epidemic of much greater severity than any that has occurred since 1867. In that year 43,146 deaths were recorded as due to cholera, but at that time no proper arrangements for death registration had been

com,leted, and the mortality was probably greatly under-estimated. In 1892, 75,959 deaths were recorded, equal to a death-rate of 3·70 per 1,000. During the year the climatic conditions were peculiar. A higher temperature than usual until the end of May, and a rainfall that, during the first six months of the year, was very deficient, led to a serious scarcity of food stuffs in many parts of the province, and a general diminution of the supply of water. In the submontane tracts many of the streams were dried up, and the water level in the tanks and wells was much lower than usual. The water supply was not only scanty, but was in consequence more than ordinarily impure. In the Punjab, the cholera death-rate is generally greatest in August, then comes September, and next in order July, June, and May. In 1867, the percentage of cholera deaths in May and June was much above the average; in 1892 this peculiarity of monthly distribution was much more marked; about one-third of the registered deaths occurred in May, and more than one-fourth in June, while only 7·2 per cent. of the total occurred in August. In the end of 1891 cholera was present in Bannu, and between the 1st and the 9th January 1892, when the outbreak ceased, 60 deaths from cholera occurred in that district. Early in February there was a smart outbreak in a village of the Kohat district, but from the 7th of February until the 24th of March, not a single cholera death was recorded in the province. Between the 24th and 31st of March cholera appeared in 14 districts, and before the end of April in other 16; the remaining district, Dera Ghazi Khan, escaped until the 11th of June. The Sanitary Commissioner attributes the severity of the outbreak in part to the Hardwár fair. The cholera death-rate in the rural circles of the districts was 3·76. The highest rate, 11·36 per 1,000, was returned from Bannu, the next highest rates were recorded in Kurnal, Montgomery, and Hissar, 9·35, 7·36, and 7·13 respectively. Muzaffargarh had the lowest death-rate, ·42 per 1,000, and Simla ·58, Hoshiarpur ·48, Gurdaspur ·61, and Jullundur 1·0, were the next in order. In the towns the death-rate from cholera averaged 2·90 per 1,000, and ranged from 10·89 in Dera Ismail Khan to ·10 in Sadhaura in the Umballa district. There was no death registered in Tanda and Urmar in the Hoshiarpur district.

In the Central Provinces the total number of deaths from cholera registered was 39,972, and the death-rate in the province from this cause was 4·21 per 1,000. Of the 160 registration circles into which the province is divided, cholera was more or less prevalent in 127. The disease was most severe in the Chattisgarh division, it also prevailed in the Northern and Central districts, the Eastern part of the province was comparatively free. The highest death-rates were recorded in Raipur 13·50, Bilaspur 8·25, and Sambalpur 4·84. The conditions favouring the spread of cholera are only too patent. Filth, sodden village sites, and a water-supply polluted in every possible way, the latter evil being especially intensified in the year under report by deficiency of the winter rains and a late monsoon, conditions attended by a temperature in excess of the average during the first half of the year. Moreover, in 1892, although the rice crop was good and the outturn of wheat fair, the return of the other food grains was deficient, and the demand for wheat for export forced up prices, so that the pinch of poverty was felt by the poorer classes.

Cholera was prevalent throughout the whole of Berar in 1892, the highest mortality being in the Buldana district (1·3), and the lowest in Basim (·2). The total number of deaths was 2,030 against 7,958 in 1891, and 4,413 the mean of the previous five years. The death-rate from cholera was ·7 against 2·8 per 1,000 in 1891.

During 1892, 42,900 deaths in the Bombay Presidency were attributed to cholera, and the ratio of deaths per 1,000 of the population was 2·28 against ·95 in 1891 and 1·38, the mean of the previous five years. Of the collectorates, Karachi, Dharwar, and Hyderabad, where the death-rates were 9·98, 7·91, and 6·28 respectively, were the most severely affected, and the least mortality occurred in Bombay City, Ratnagiri, and Broach, in which the ratios were ·20, ·08, and ·05 respectively. Out of 222 rural circles of registration, 189 were more or less affected by cholera during the year, and in 37 the death-rate was upwards of 5 per 1,000. Out of 56 town circles, 44 returned fatal cases of cholera, and in 11 the death-rate was over 5 per 1,000. Of the 25,206 villages in the Presidency, in 3,080 cholera was present, the highest percentage of villages attacked was in the Karachi district, where 424 out of 792 villages were affected, equal to 53·60 per cent. The proportions of villages attacked in the districts of Belgaum, Dharwar, Hyderabad, Shikarpur, and Upper Sind Frontier were also high. The great fair held in July at Pandharpur passed off without any serious outbreak of the disease; the first case did not occur until the fair was practically over, and only

27 deaths occurred in all. Cholera was prevalent only to a very slight extent in the Sholapur Collectorate, in which Pandharpur is situated; and in this connexion the Sanitary Commissioner states that in his experience cholera occurs at fairs only when it is previously prevalent in the district in which the fair is held.

The number of deaths registered as due to cholera in Madras in 1892 was 79,033, being 19,740 less than in 1891. The death-rate from this cause was 2·3 per 1,000. In no month of the year was the disease absent, but there was a very great decrease in the mortality during the three last months of the year. The greatest numbers of deaths were registered in January (18,676), July (16,739), and August (13,003), and the smallest in October (876), November (490), and December (286). The disease was most severe in the Godávari, Kurnool, and Tanjore districts, where the death-rates per 1,000 were respectively 6·5, 6·0, and 4·1. In the first two of these districts the very deficient rainfall of 1891 was followed by a rainfall much above the average in 1892. Out of 44,678 villages in the Presidency, 17·5 per cent. were attacked, the highest ratio was recorded in the Kurnool district, where 36·0 per cent. of the villages were affected. The disease was more severe in urban than in rural circles, the death-rate in municipal towns being 3·2 per 1,000 of the population. The highest death-rates are returned by Periyakulam 14·7, and Anantapui 11·5 per 1,000. In two municipalities, Palni and Ootacamund, no death was recorded.

Fifty-eight deaths were registered in Coorg as having been caused by cholera; the death-rate from this cause was 0·33, the mean ratio per 1,000 for the previous five years having been 0·03.

In 1892, in Rajputana, a severe visitation of cholera caused 26,760 deaths. The disease was epidemic in Bikanir at the beginning of the year; in April it appeared in many different and distant parts of the province, and the distribution soon became general. The severity of the epidemic increased during May and reached its maximum in June. The mortality in July was great, but it declined in August and September, and towards the end of the year became slight. The States that suffered most were Marwar, Bikanir, the British district of Ajmere-Merwara, Jeypur, and Ulwar. In parts of the three first named there was scarcity, in some places approaching famine, during the greater part of the year, and the water-supply was very deficient.

During the year, in Lower Burma 6,208 deaths were recorded as due to cholera, the death-rate per 1,000 of the population attributed to this disease being 1·38. The Arakan division suffered most severely, the death-rate there having been 2·91. Of the 16 districts, cholera deaths were reported from all except Tavoy and Mergui. The largest numbers of deaths were returned from Akyab (1,592), Bassein (1,072), and Henzada (727). Out of 118 circles of registration and 17,414 villages, 96 and 1,497 respectively, reported deaths from this cause. In Akyab town cholera was very prevalent in the latter part of February and in March, the epidemic died away in April and May, but fatal cases again became frequent in June and July, in which months 55 and 41 inches of rain respectively were registered. In Bassein town cholera broke out in January and lasted until June. In Toungoo the first case occurred on the 4th of May, the first day on which rain fell, and the epidemic attained its greatest intensity in June and July, the two months of heaviest rainfall.

The following is a summary of the reports regarding the outbreak of cholera in regiments and jails:—

Among European troops the disease appeared on 38 occasions. In six instances the men first attacked had been exposed to unusual fatigue, and in one case the disease declared itself after prolonged exposure to the heat of the midday sun. In 22 cases premonitory diarrhœa is stated to have occurred. In seven cases the seizure was connected with some dietary indiscretion, and in two cases with over-indulgence in alcoholic liquor. Among the native troops unusual fatigue is said to have been undergone by the first sufferers in 10 out of a total of 96 outbreaks, and in 34 cases the existence of premonitory diarrhœa is recorded. In 13 cases, excesses in eating immediately preceded the attacks. In two cases the abuse of alcohol was considered to be connected with the seizures. In the jails there were 65 outbreaks. In six first cases the disease supervened on unusual fatigue. The occurrence of premonitory diarrhœa was noted in 11 instances. At Thayetmyo two prisoners were admitted to jail suffering from cholera.

Among European troops diarrhœa seems to have been unusually prevalent during the occurrence of nine outbreaks, among native troops during seven, and in jails during 15.

In the stations in which cholera occurred among European troops, there were 720 buildings occupied by them, of these 85 or 11·8 per cent. furnished cases. The number of buildings occupied by native troops in the stations in which cholera was present among them was 8,343, and cases of cholera came from 239, or 2·8 per cent. In the jails 168 out of 1,117, or 15·0 per cent. of the buildings occupied by prisoners in infected jails furnished cases.

The disease appears to have occurred under nearly all possible variations of meteorological conditions.

Among European troops in nine of the 38 outbreaks cholera is said to have been imported or to have been brought from places where cholera was known to exist, and in other seven cases this was thought to have been the case. Among native troops the disease was said to have been imported in 31 cases and into the jails in 13 cases.

Attendants attacked.—The following statement shows the number and percentage attacked of those actually in attendance on persons suffering from cholera :—

Communities.	Number of Cases of Cholera treated.	Medical Officers, Hospital Assistants, and other Attendants on Cholera Cases.		Percentage of Attendants attacked.
		Number.	Number of these attacked.	
European troops	231	485	6	1·23
Native troops	514	1,379	41	2·97
Jails	462	587	18	3·06
Total	1,207	2,451	65	2·65

Sanitary defects in connexion with cholera epidemics.—In the returns regarding the European troops no sanitary defect is mentioned in this connexion, except in the cases of Ferozepore and Secunderabad; in the former of these places the surface drainage is stated to be imperfect, and in the latter the conservancy arrangements are said to have been defective.

Regarding the surroundings of the native troops attacked, deficient drainage is frequently the subject of complaint, and in a few instances overcrowding existed. At Fort Aijal and at Aurungabad the water supplies appear to have been bad, and at Dharmsala, Ajmere, Deoli, and Nusseerabad the supplies were insufficient. The surroundings of the troops at Barrackpore, Raichur, and Kohat were insanitary. At Kohat, while the supply of drinking water is good and is protected from contamination, a foul stream runs behind the lines of one regiment, and around a portion of the parade ground. The sanitary state of the environs of the cantonment is reported to be extremely bad.

In the affected jails imperfect drainage and overcrowding are frequently noted, and in a few cases the drinking water was bad.

Cholera camps.—The effects of moving into camp were generally satisfactory. European troops moved into camp from 20 cantonments in 86 parties. Cholera appeared in eight of these parties, and the total number of cases after leaving cantonments was 18. Thirty-six native batteries and regiments went into camp in 97 parties, 20 of the parties were attacked, and the total number of attacks after moving was 107. Forty-eight parties were encamped from 19 jails, and 74 seizures were recorded subsequent to removal.

Small-pox.

During 1892 the mortality from small-pox in India was heavier than in the preceding year; the total number of deaths being 101,121 in 1892 against 98,831 in 1891; and it will be observed from the following table that this increase was general almost all over the country, from only two provinces, Assam and the North-Western Provinces and Oudh, were smaller numbers of deaths returned from this cause than in 1891. Distributed according to months the greatest number of deaths occurred in March, and the least in November. The highest death-rates were recorded in Coorg, Mysore, and Madras, and the lowest in Berar and the Central Provinces.

Statement showing the Deaths from Small-pox registered in the different Provinces, by months, during the year 1892.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratio of Deaths per 1,000 of Population.	
													1892.	1891.	1892.	1891.
Bengal - -	2,221	2,972	4,093	3,354	2,936	1,864	1,335	977	533	448	626	1,000	22,359	16,193	0·31	0·23
Assam - -	78	190	208	141	237	99	76	101	64	48	67	143	1,452	2,361	0·29	0·47
North - Western Provinces and Oudh.	487	537	805	1,087	1,386	1,286	856	474	246	115	137	293	7,709	26,355	0·16	0·56
Punjab - -	965	655	766	1,193	1,985	1,782	1,404	723	407	349	343	601	11,173	3,426	0·54	0·17
Central Provinces	22	26	51	108	145	166	119	133	74	48	47	56	995	748	0·10	0·08
Berar - - -	5	5	10	10	14	10	7	3	—	—	2	2	68	34	0·02	0·01
Lower Burma -	49	58	151	105	99	165	146	163	106	76	120	225	1,463	1,326	0·32	0·29
Madras Presidency	5,405	6,437	6,872	5,728	3,802	2,878	2,612	2,261	2,039	1,888	1,619	2,116	43,757	41,322	1·3	1·4
Bombay - -	206	308	500	451	305	270	196	126	92	78	76	162	2,770	1,491	0·15	0·08
Mysore - -	745	888	786	781	853	802	827	719	551	478	489	543	8,462	5,099	1·75	1·05
Coorg - - -	190	183	176	96	68	54	34	39	29	19	11	14	913	476	5·27	2·75
Total -	10,373	12,259	14,418	13,054	11,830	9,376	7,612	5,819	4,141	3,517	3,537	5,155	101,121	98,831	—	—

Although the mortality from small-pox in Bengal in 1892 was insignificant when compared with that from other causes, still it was the highest on record since 1882. The number of deaths registered as due to this disease was 22,359, equal to a death-rate of ·31 per 1,000. The disease affected 60 circles more or less severely, and was absent from 282. The largest number of deaths occurred in March (4,093) and in April (3,354). The prevalence of the disease to any serious extent was practically limited to Orissa, Chota Nagpore, and Midnapore, where, owing to the strong prejudices of the people, vaccination has made but little progress. It is hoped that, under the new decentralization scheme, to which reference was made last year, whereby civil surgeons have been made directly responsible for the vaccination of their districts, these parts of the province will be efficiently protected, and enjoy as great an immunity from small-pox as the rest of the province. The districts which suffered most were in order, Puri, Cuttack, Lohardaga, Midnapore, and Palamow. The urban mortality was the same as last year, ·48 per 1,000. Among children under 12 years of age there were 14,754 deaths,—nearly 66 per cent. of the total small-pox mortality; as the Sanitary Commissioner remarks, "nothing could show more clearly "than these figures the necessity that exists for increased vigilance on the part of the "Vaccination Department."

In the port of Calcutta no death from small-pox occurred among the European seamen or among the Native floating population.

In Assam the number of deaths from small-pox was 1,452, and the death-rate ·29 per 1,000, against 2,361 deaths and a death-rate of ·47 in 1891. In Kamrup 1,025 deaths were registered, and the death-rate was 1·62. In Nowgong there was no fatal case; in the Khasi and Jaintia Hills only one death, and in Lakhimpur three deaths. Of the *sadr* towns, Gauhati had the highest death-rate, 3·24 per 1,000, while there was no death recorded in Sylhet, Dhubri, and Nowgong. In all the *sadr* towns 47 deaths occurred, and the average rate of mortality among their inhabitants was ·69 per 1,000. Of the deaths 229 occurred among infants under one year, and 869 among children under 12 years of age.

The deaths from small-pox in the North-Western Provinces and Oudh numbered only 7,709, and the death-rate, ·16, was the lowest on record since 1871. In no district was the mean ratio of the previous five years, ·73, exceeded. Only one death from small-pox was recorded in the Cawnpore district, two in Lucknow, and three in Meerut, the aggregate population of these three districts being 3,375,316. Of the larger municipalities, Moradabad had a death-rate of 1·47, Ghazipur 1·42; the next highest was Muttra, with ·53 per 1,000. Only one of the smaller municipalities returned a death-rate from small-pox higher than ·26 per 1,000, viz., Pilibhit, where the rate was 2·19. Of the 101 towns in the province with a population above 10,000, in 50 no death from small-pox was registered, while in 26, only one or two deaths occurred.

In the Punjab the number of deaths recorded as due to small-pox was 11,173, giving a death-rate of 0·54 per 1,000, which is very slightly (·02) above the average

for the last five years. As in 1891, the highest mortality occurred in the Bannu district, where the death-rate was 4·08 per 1,000. As noted last year, vaccinators have special difficulties to contend against in this district, the proportion of the population successfully vaccinated in 1891–92 being 27·13 per 1,000, against 33·24, the average rate in the province. The next highest mortality was recorded in the neighbouring district of Kohat (2·45). These districts are followed by Peshawar (1·81) and Ludhiana (1·23). The lowest mortality, ·004 per 1,000, occurred in the Jhang and Gujranwala districts, in which two and three deaths occurred respectively. The reported small-pox death-rates in Gujrat (·01), Kangra and Dehra Ghazi Khan (·03), Gurdaspur and Sialkot (·04), were also very small.

In the Central Provinces, in 1892, small-pox was more prevalent than in 1891, but excluding that year it was less so than in any of the previous eight years. The total number of deaths registered from this cause was 995, giving a death-rate of ·10 per 1,000. It is worthy of note that in three districts, Murwara, Jubbulpore, and Burhanpur, no death from small-pox was registered, while in Nimar there was only one death. In five districts only was the mortality severe, viz., Bilaspur, Saugor, Raipur, Chanda, and Sambalpur.

There were 68 deaths from small-pox registered in Berar, the death-rate from this disease being ·02 per 1,000 against ·2, the mean of the previous five years. Deaths occurred in all districts except Ellichpur. The death-rate was equally divided between the sexes, and all the deaths occurred among children under 12, 51·5 per cent. of the fatal cases being infants under one year.

The total number of deaths registered in the Madras Presidency as due to small-pox in 1892 was 43,757; the death-rate per 1,000 of the population was 1·3. The largest number of deaths occurring in any one month was 6,872, in March; the smallest, 1,619, in November. The Sanitary Commissioner points out that, just as the maximum mortality from small-pox usually occurs during the dry months and the minimum during the wet months, so years of deficient rainfall, such as 1890 and 1891, are followed by years of excessive prevalence of small-pox. Of the total mortality, 46 6 per cent. occurred among children under 12 years of age. The increase in the small-pox mortality in 1892, as compared with 1891, was chiefly due to the great prevalence of the disease in the Malabar and Godavari districts. In Malabar the death-rate was 4·4. Here it appears that vaccination is carried on under several disadvantages,—the houses of the people are much scattered and not collected together in towns and villages as in other districts, the females who are said to have a preponderating and unusual influence in this district are much opposed to vaccination, while the highly conservative Moplah population oppose any practice that is new to them. Small-pox deaths were registered in 47 of the 55 municipal towns. Cochin heads the list with a death-rate of 19·9 per 1,000. Vaccination is not compulsory in Cochin, and the people are opposed to it. It is further explained that many of the deaths from small-pox occurred among people from the neighbouring Native States who came to the hospital in Cochin for treatment. The lowest death-rate (·06) was returned from Madras, in which town vaccination is carried on thoroughly and efficiently.

Small-pox was epidemic in Coorg throughout the year, but most severely during the months of January, February, and March. Of the 913 deaths registered as due to small-pox, 549 occurred during these months. The death rate was 5·27 per 1,000 of the population, compared with 2·75 in 1891, and 1·07 the average of the previous five years.

During 1892 there were 2,770 deaths recorded in the Bombay Presidency as due to small-pox, and the death-rate was ·15 per 1,000, against ·08 in the previous year, and ·31, the decennial mean In the collectorates the highest death ratio, ·67 per 1,000, was registered in the town and island of Bombay; the next highest was ·46, returned from Dharwar. The lowest ratios per 1,000 were reported from Surat, Ahmedabad, Kaira, and Shikarpur. In the Upper Sind Frontier no fatal case occurred. Of the deaths 24·99 per cent. were among infants under one year of age, and 46·71 per cent. among children over one year and under 12 years of age. The disease was present throughout the year; it reached its maximum intensity in March and then began to decline, the smallest number of deaths being registered in November, and the number rising again in December.

In Lower Burma 1,463 deaths were recorded in 1892 as caused by small-pox, the provincial death-rate being ·32 against ·29 in 1891, and ·46 the mean of the previous

five years. The district which suffered most severely was Akyab, where the ratio of deaths from this cause was 1·98 per 1,000, the next highest rates were returned from Pegu, ·96, Hanthawaddy, ·27, and Shwegyin, ·24. No death from small-pox was reported in the districts of Sandoway, Mergui, and Toungoo, and in the districts of Bassein, Prome, Thayetmyo, and Tavoy only 10, 4, 1, and 1 deaths respectively were recorded. Deaths were reported to have occurred in 55 out of 118 circles of registration. Of the total number of those who died 979 were under 12 years of age, and of these 274 were infants.

Everywhere, excepting in the Central Provinces and Berar, fevers were more prevalent than in the preceding year, and in India, as a whole, the total number of deaths recorded in 1892 was 4,621,583 against 3,817,683 in 1891, and 4,105,890 in 1890. It will be seen from the following table that the mortality was extremely heavy during the last quarter, and that the smallest numbers of deaths occurred in June and July:— Fevers.

Statement showing the Deaths from Fevers registered in the different Provinces, by months, during the year 1892.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratio of Deaths per 1,000 of Population.	
													1892.	1891.	1892.	1891.
Bengal	144,114	146,882	186,444	137,741	128,848	91,983	94,267	130,498	115,047	130,968	161,621	139,303	1,607,716*	1,333,395	22·84	18·94
Assam	6,246	6,577	8,836	7,694	8,828	8,845	8,969	8,450	7,785	8,095	6,958	6,688	93,971*	75,965	18·72	15·13
North-Western Provinces and Oudh.	98,075	84,661	113,568	123,941	114,794	88,226	72,576	72,291	92,427	105,730	104,498	97,290	1,168,077	1,033,059	24·90	22·02
Punjab	47,835	37,812	39,149	36,105	39,447	34,416	28,923	29,960	31,824	160,378	112,645	67,300	715,890	442,254	34·83	21·52
Central Provinces	13,187	13,719	19,041	19,343	15,218	11,361	12,160	14,842	16,689	18,244	18,197	16,016	188,017	190,550	19·79	21·61
Berar	3,093	3,022	5,249	5,417	2,892	1,676	1,911	2,718	3,777	4,341	4,360	3,204	41,661	49,850	14·6	17·5
Lower Burma	3,622	2,988	3,228	2,862	2,834	3,149	4,168	4,352	3,930	3,841	4,332	5,116	44,422	35,658	9·84	7·76
Madras Presidency	24,692	20,698	25,125	22,698	21,700	19,822	24,314	25,789	23,957	22,404	24,242	25,186	280,627	247,029	8·3	8·6
Bombay Presidency	57,782	34,985	37,903	29,269	25,628	25,480	32,063	33,441	34,373	39,921	48,529	38,664	438,038	368,913	23·27	19·60
Mysore	3,138	3,165	3,727	3,443	3,316	3,252	3,341	3,133	3,337	3,185	3,358	3,310	39,705	38,307	8·19	7·91
Coorg	221	206	212	208	263	364	394	381	340	322	271	277	3,459	2,703	19·98	15·61
Total	402,005	354,715	442,482	388,721	363,769	288,574	283,086	325,855	333,486	407,429	489,011	402,450	4,621,583	3,817,683	—	—

* Includes 6,734 deaths from "Kala azar."

There were 1,607,716 deaths registered as due to fever in Bengal in 1892, and the death-rate for the year was 22·84 per 1,000 of the population. The death-rate from this cause has been rising steadily; the average of the last ten years was 15·17 per 1,000, of the last five years 16·37; while in 1891 it was 18·94. Allowing an increase of 2 per 1,000 for improved registration this year, the mortality is still 2 per 1,000 in excess of that of 1891, and 4 per 1,000 in excess of the average of the years 1887–91. The mortality in rural circles was 23·01 per 1,000, and ranged from 37·23 in Rajshahye to 13·24 in Singhbhum and 6·63 in Puri. In the towns the average fever death-rate was 18·57, a notable increase compared with last year, when it was 12·55, and it ranged from 49·74 in Chanduria, in the Khulna district, to 7·14 in Darjeeling. As a rule, the highest mortality occurs during the three months after the rains, but in the year under review the mortality was greatest in the first three months of the year. This is explained by the Sanitary Commissioner as due to the lowered vitality of the people owing to the scarcity caused by the prolonged drought, and the more than ordinarily poisonous state of the water-supply from the same cause. The most unhealthy divisions in the province were, in order, Rajshahye, the Presidency, and Bhagulpur. In the first-named the highest death-rates occurred in the districts of Rajshahye and Jalpaiguri districts situated in the Terai with insufficient drainage and a very impure water-supply. The Sanitary Commissioner writes:—

"The water-courses, which are the main drainage channels, have changed their "direction, and left a chain of swamps in their ancient beds. Exactly the same thing "has occurred in the districts of Jessore and Nadia, and to a lesser extent in "Murshidabad; and in the first two of these districts the population has declined "by 18,687 and 50,548 respectively. Jessore and Nadia are now seamed with the "beds of extinct rivers, and the few which maintain a languid vitality during the "rains, are in the dry weather a chain of fœtid swamps. The evil has also, I am "afraid, been intensified by the construction of railways and feeder roads with

"insufficient waterways, and nothing but comprehensive drainage schemes can now "restore these districts to their former state of salubrity."

The increase in the mortality from fevers in the Bhagalpur Division, which formerly was noted for its healthiness, is said to be in part due to the increase which has taken place in the population, and consequent deterioration of the public health, and, in 1892, to the scarcity and the bad water-supply owing to the drought, but in part also, the Sanitary Commissioner fears, to obstruction from various causes to the free drainage of the country. Chota Nagpore generally enjoys an immunity from fevers unknown in the Gangetic Delta, but this year in two districts, Hazaribagh and Palamow, the fever death-rates were 26·63 and 29·49 per 1,000 respectively. In Palomow, this is partly accounted for by the occurrence in January, February, and March of a severe epidemic of influenza; but in Hazaribagh, the fevers seem to have been of the ordinary malarial type. Orissa was relatively free from fever, the death-rate from this cause having been 12·70 per 1,000 against 9·91 in 1891 and 8·49 the average of the five years 1887–91.

At the end of the year a scheme was put in practice, which it may be hoped will tend to lessen the suffering from periodic fevers under which the people of Bengal labour. Quinine, enclosed in sealed packets, in doses of five grains, is now for sale in most of the post offices in the province, at the price of one pice a packet. A dose of pure quinine is thus placed within the reach of every person in Bengal who has a pice wherewith to buy it. It is too soon yet to hazard an opinion as to how far the people will ultimately take advantage of the plan, but so far the number of purchasers is considered to be encouraging.

Among the European sailors in the Port of Calcutta, there were 310 cases of "fever" with one death, which resulted from enteric fever. There were five cases of enteric, 96 of malarial, and 209 of simple continued fever, against 8, 106, and 88, respectively, in 1891.

The total number of deaths recorded under this heading in Assam, in 1892 was 93,971, 18,006 in excess of the number recorded in 1891, and 24,273 in excess of the average of the previous quinquennium. The death-rate was 18·72 per 1,000, against 15·13 in the previous year, and 13·88, the average of the years 1886–90. In the Surma Valley the mortality from this cause was 15·01; in the Assam Valley 22·77; and in the Khasi and Jaintia Hills 6·53 per 1,000. Of the districts of the Assam and Surma Valleys, the lowest fever death-rate, 13·38, was returned from Lakhimpur, and the highest, 29·79, from Goalpara. The rural death-rate from fever was 18·74, and the urban 17·40. Among the towns, the death-rates ranged from 54·00 in Nowgong, to 3·80 in Maulvi Bazar in Sylhet, and 1·43 in Jowai, in the Hill District.

The heading "Fevers" includes *Kala azar*, and the following table shows the number of fatal cases of this disease recorded in the various districts in 1892 compared with 1891 :—

	Number of Deaths from *Kala azar*.	
	1892.	1891.
Cachar	2	—
Darrang	1,187	232
Nowgong	865	77
Lakhimpur	1	—
Kamrup	3,879	8,682
Khasi and Jaintia Hills	8	1
Goalpara	792	945
TOTAL	6,734	9,937

These figures, as setting forth accurately the mortality from *Kala azar*, must be taken for what they may be worth, seeing that the diagnosis is made in the majority of the cases by unprofessional persons, but the increase in the numbers of fatal cases in Darrang and Nowgong is noteworthy, and the decrease in Kamrup remarkable. In Cachar and Lakhimpur cases were registered for the first time. A valuable and interesting appendix to the Sanitary Report, made up of contributions by Civil Surgeons and Medical Officers of the tea gardens in the province, deals with the relation of the *anchylostomum duodenale* to anæmia, and of *anchylostomiasis* to *Kala azar*.

The most important contribution is that by Surgeon-Major E. Dobson, M.B., Civil Surgeon of Dhubri. It is impossible here to do more than summarise the account of his laborious enquiries, which deal mainly with the effects produced on the health of the host by the presence in the intestines of the *anchylostomum*. Dr. Dobson selected 605 "of the healthiest-looking of the coolies" who arrived at Dhubri with the intention of executing labour contracts in Assam, and set himself to ascertain how many of them harboured the parasite. In the cases of 58, observations could not be concluded, and it is fair to exclude them. Of the remaining 547, in 454 or 83 per cent. *anchylostoma* were present, in 88 instances associated with other parasites. In 23 cases more than 50 worms were obtained and in one case 230. In 366 cases less than 20 worms were obtained and in only seven cases 100 or more.

Thirty-three coolies, who were rejected at Dhubri on account of anæmia, were examined: of these 26 or 78·78 per cent. had *anchylostoma*, in two cases over 50 worms were obtained. Forty-two coolies were rejected because of enlargement of the spleen, 31 or 75·61 per cent. had *anchylostoma*, in one case over 50 worms were present. Twenty-one coolies were rejected for other causes; *anchylostoma* were present in 18 cases, or 85·71 per cent.

During his researches, Dr. Dobson found the parasite in persons newly arrived from Behgal, Behar, Orissa, Chota Nagpore, the Central Provinces, the North-Western Provinces, the Panjab, Madras, and Nepal. Both sexes at all ages, Hindu and Muhammadan alike, harboured the parasite without apparent ill effect. Regarding the relationship of the *anchylostomum* to *kala azar*, Dr. Dobson remarks that "in cases of that disease it is often not found." On this aspect of the question the following extracts from the report by Surjeon-Major Macnamara, M.B., Civil Surgeon of Gauhati, in Kamrup, are very pertinent:—

"I can see nothing in common between these diseases unless the symptoms of anæmia and its consequences . . . . In this district we have two diseases to deal with, *viz.*, the anæmic dropsy of coolies, and the *kala azar* which I believe to be distinct, because the anæmic dropsy of coolies has been always with us and no suspicion of propagation from person to person has ever been raised until a conclusion, I believe, not fully warranted by facts was come to, and it was put in the same category with a disease which came as an epidemic, and which is now, so far as I can ascertain, dying out. The disappearance of *kala azar* from the places where it was prevalent without any corresponding synchronous sanitary improvements, seems to me to weigh strongly against a parasitic origin, more specially when the entozoon concerned is supposed to develop with ease and rapidity. All that is now certain, is that we have had a disease of the most fatal kind, which has *alike* attacked villagers and garden coolies, and which has certainly subsided of late. Since my arrival here I have satisfied myself of two facts—first, that many men enjoy good health with large quantities of the *anchylostoma*, second, that many men die of *kala azar* who have given no parasites after treatment with thymol or on *post-mortem* examination."

From the reports furnished by a number of the Medical Officers of the tea-gardens, it appears that the chain of symptoms described as *anchylostomiasis* does not usually develop until some months after arrival in Assam.

The following conclusions seem to be justified:—

(1.) The presence of the *anchylostomum* in the intestines does not necessarily give rise to serious symptons, unless other circumstances favour this result.

(2.) The presence of the *anchylostomum* in the intestines may be a serious complication, but it is not the cause, of *kala azar*.

The so-called Beri-Beri of Ceylon and Assam has no connection with the disease known by this name, the signs and symptoms of which are chiefly due to the effects of peripheral neuritis, which occurs in the Dutch East Indies, Hong Kong, the Straits, and occasionally in Burma; it is probable that this disease rarely, if ever, occurs in Assam.

The number of deaths recorded under fevers in the North-Western Provinces and Oudh in 1892 was 1,168,077, and the death-rate was 24·90 per 1,000 against 1,033,059 deaths and a death-rate of 22·02 in 1891. The deaths from fevers were in excess in the first half of the year, the highest monthly mortality, 123,941, being recorded in April. October, in which month most fever deaths are generally registered, came next with 105,730. The highest death-rate, 41·22, was returned from the Naini Tal district, which includes the Tarai and Bhabar, the next highest rate was in the Saharanpur district, 36·34, and ratios over 30 per 1,000 were returned from the Meerut, Muzaffarnagar Bulandshahr, Bahraich, and Kheri districts. The death-rates recorded in the larger municipalities ranged from 34·88 in Saharanpur to 7·05 in Gorakhpur. Among the

minor municipalities, Manglaur returned a death-rate of 49·43, while in Bulandshahr, Sikandrabad Sardhana, and Hapur, the rate was over 40 per 1,000.

The average fever death-rate in the Punjab in the previous five years was 23·27; in 1892 the rate was 34·83 per 1,000, no less a number than 715,890 deaths having been registered under this heading. In the Gurgaon district the death-rate was below the average of the previous five years, and in Rohtak, Delhi, Karnal, and Simla, the excess above the average was moderate, but with these exceptions the death-rates in all districts were greatly above the average. The Gurdaspur district suffered most severely (49·53 per 1,000), the neighbouring district of Sialkot comes next (44·70), then follow Bannu, Mooltan, Dera Ismail Khan, and Muzaffagarh. The death-rate, especially in the North-Western districts, was raised in the early months of the year by the occurrence of a widespread epidemic of influenza, the deaths from which were recorded as fever. During the cold weather months typhus fever is said to have prevailed in the frontier districts, especially in Peshawar and Rawal Pindi. The vast majority of deaths, however, were caused by fevers of malarial origin, and occurred in the months of September, October, November, and December. The Sanitary Commissioner attributes much of the prevalence of malarial fevers in many districts to excessive rainfall during the third quarter of the year. In the flat Punjab plains heavy rain soon causes floods, and when this is succeeded by a high temperature, fever follows. The comparative scarcity of food in many districts doubtless rendered the members of the poorer classes easy victims to the effects of the malaria.

The number of deaths registered in the Central Provinces as due to fevers during the year was 188,017, against 190,550 in 1891. Compared with that year, there was an increase in the mortality in seven districts, and a decrease in 13. The provincial death-rate was 19·79 per 1,000 of the population against 20·05 last year, calculated on the census of 1891, and 20·40 the mean of the previous five years.

In Berar, under the heading "fevers," there were 41,661 deaths registered in 1892, the provincial death-rate from this cause being 14·6, that is, 1·0 1,000 lower than the average of the previous five years. The highest district rate was returned from Wun, 18·0, and the lowest, 12·0, from Basim.

The number of deaths registered under this heading in Madras was 280,627, a higher mortality than in any year since 1879. Although the death-rate was doubtless rendered higher in several parts of the Presidency owing to the prevalence in them of influenza, still the principal cause of the increased mortality was malarial fever, said to have been due to the heavy rainfall; the public health had been depressed on account of the scarcity that prevailed, and the people were less able than usual to withstand the ill effects of their insanitary surroundings. The death-rate for the Presidency was 8·3 per 1,000 against 7·3 in 1891. The highest district death-rate (22·8) was, as is usual, recorded in Kurnool, while the rate was lowest (2·2) in Tanjore. In the Municipal towns the death-rate was 7·0 per 1,000. The highest rate was 31·4 in Kurnool; the lowest 1·5 in Dindigul.

The total number of deaths from fevers in Coorg was 3,459, and the death-rate was 19·98 per 1,000 of population. The mean ratio of the previous five years was 17·24.

In the Bombay Presidency during 1892, 438,038 persons are reported to have died from fever, and the ratio of deaths per 1,000 of the population was 23·27, against 19·60 in 1891, and 18·32 the mean ratio of the 10 years 1882 to 1891. Of the registration districts the rates were highest in Gujarat and Sind, 34·89 and 27·63 per 1,000 respectively, and lowest in the Southern, 18·24. In 11 collectorates the death-rate was higher than the provincial mean, the list being headed by Ahmedabad, where 41·41 deaths per 1,000 of the population were registered. Exceedingly high death-rates were also recorded in Broach, 35·06, Shikarpur, 34·49, Kaira, 33·76, and Surat, 31·22 per 1,000.

The number of deaths registered as due to fever, in Lower Burma, in 1892 was 44,422, which is the largest number on record. The death-rate for the province under this heading was 9·84, against 7·76 in 1891, and 8·71 the mean of the previous five years. Deaths from fevers were returned from all the registration circles except one. The highest rates of mortality were returned from the three districts of the Arakan division, Akyab (19·47), Sandoway (15·16), and Kyaukpyu (14·64). The lowest death-rates were recorded in the districts of Thongwa (4·44) and Pegu (4·61). Among the towns the highest rate, 23·79, was registered in Pegu; the lowest, 1·33, in Zalun, in the Henzada district. The mean death-rate in urban areas was 8·58, and in rural areas 10·02.

In India as a whole, the total number of deaths returned under "dysentery and diarrhœa" was 234,370, or 9,086 less than in the preceding year. This decrease, however, was confined to the North-Western Provinces and Oudh, the Central Provinces, Berar, Madras, and Bombay. In all the other provinces the mortality was greater than in 1891. Dysentery and diarrhœa.

Statement showing the deaths from Dysentery and Diarrhœa registered in the different Provinces, by months, during the year 1892.

Province.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.		Ratios of Deaths per 1,000 of Population.	
													1892.	1891.	1892.	1891.
Bengal	4,261	3,973	4,096	3,807	4,450	3,827	4,341	5,540	3,732	3,476	3,629	3,359	48,491	43,183	0·68	0·61
Assam	1,022	884	892	914	1,362	1,369	1,523	1,602	1,644	1,583	1,575	1,315	15,685	14,418	3·12	2·87
North-Western Provinces and Oudh.	3,499	2,444	2,768	3,400	4,349	3,693	3,580	3,664	4,141	3,994	3,639	3,277	42,448	49,586	0·90	1·06
Punjab	780	483	480	839	1,238	1,019	883	1,196	2,903	5,202	4,081	2,674	21,781	12,152	1·06	0·59
Central Provinces	932	864	1,425	1,435	1,410	1,139	1,513	2,059	1,848	1,408	1,093	895	16,021	20,889	1·69	2·37
Berar	870	767	981	868	586	496	847	1,229	1,532	1,266	1,057	703	11,200	22,007	3·9	7 7
Lower Burma	255	203	240	310	415	592	893	751	631	477	371	311	5,449	4,162	1·21	0·91
Madras Presidency	4,481	2,511	2,237	1,830	2,430	2,368	3,434	3,773	3,044	2,346	1,920	1,919	32,293	34,223	1·0	1·2
Bombay „	2,502	2,127	2,234	2,435	2,783	3,019	4,026	4,041	3,495	3,061	2,952	2,731	35,406	37,728	1·88	2·00
Mysore	433	411	362	337	387	423	516	513	511	482	500	432	5,307	4,936	1·10	1·02
Coorg	15	11	12	15	22	52	30	46	30	21	18	17	289	172	1·67	0·99
Total	19,050	14,678	15,727	16,188	19,432	17,997	21,586	24,414	23,514	23,316	20,835	17,623	234,370	243,456	—	—

In Bengal the registered number of deaths under this heading was 48,491, against 43,183 in 1891, and an average of 49,033 in the five years 1887–1891. These figures bear ratios per 1,000 of the population of ·68, ·61, and ·69 respectively. In urban circles the death-rate was 2·87, in rural circles ·59. The largest number of deaths occurred in August (5,540), the next largest in May (4,450), and January (4,261); the fewest deaths were recorded in December (3,359). As usual, Darjeeling has the highest death-rate (5·57), followed by Balasore and Howrah.

In Assam, under this heading, 15,685 deaths were registered, and the ratio of mortality was 3·12 per 1,000, against 2·87 in 1891, and 2·97, the mean death-rate of the quinquennium 1886–90. The highest rates were returned from the districts of Lakhimpur, 6·65, Cachar, 4·76, Darrang, 4·29, Sibsagar, 3·97, and Sylhet 3·31; the lowest from Goalpara ·48, and Kamrup 1·03.

There were 42,448 deaths from dysentery and diarrhœa in the North-Western Provinces and Oudh, against 49,586 in the previous year, showing a fall in the death-rate from 1·06 to ·90 per 1,000. The highest mortality was, as usual, recorded in the hill tracts, where the high rates, 7·62 and 6·02, were returned from the districts of Garhwal and Almora respectively. The Dehra Dun district shows the next highest rate, 3·85, and in Jhansi, Gorakhpur and Jalaun rates of 2·74, 2·71, and 2·44 respectively were noted. The average ratio in towns was 2·23. From Kashipur (10·26), Budaun (9·95), Hathras (9·70), Kalpi (7·55), and Koil (7·22), the highest rates were returned; in five towns only one death under this heading was returned, and in three, namely, Sahtawar, Laharpur, and Mallawan, none at all.

In the Punjab, under this heading, there were 21,781 deaths registered during the year, the death-rate being 1·06 per 1,000 against 12,152 deaths, and a rate of ·59 in 1891. The death-rate among males was decidedly higher than among females, the rates being 1·12 for males and only ·99 for females; this circumstance is mentioned by the Sanitary Commissioner as having occurred in former years. The districts of Gurdaspur and Sialkot show the highest fever mortality, and from them also are returned the highest death-rates from dysentery and diarrhœa, 2·45 and 2·27 respectively. The next highest rates are those registered in the Gurgaon, Multan, and Amritsar districts, where also the mortality from fevers was high. The lowest rates were registered in the Peshawar, Gujranwala, and Hazara districts, ·24, ·31, and ·32, respectively. It must be noted, however, that in the Peshawar and Hazara districts registration is very imperfectly carried out.

The total deaths registered in the Central Provinces from dysentery and diarrhœa were 16,021, or 4,868 less than in 1891. The death-rate was 1·69, compared with

2·20 in 1891, and 2·42 the mean of the previous five years. There was a decrease in the death-rates in almost all districts, but in a few the rates are rather high, and in Bilaspur and Sambalpur they were much higher than in 1891.

In Berar the deaths registered as due to dysentery and diarrhœa numbered 11,200, compared with 22,007 in 1891. The death-rate per 1,000 was 3·9 against 7·7 last year, and 5·9 the mean of the previous five years. The highest district death-rate, 7·8, was recorded in Ellichpur, the lowest, 1·1, in Wun.

In Madras there were 32,293 deaths recorded under this heading, 1,930 less than in 1891, and the death-rate was 1·0 per 1,000. By far the highest mortality from these diseases was recorded in Madras, 8·9 per 1,000, next comes Chingleput, with a ratio of 3·2. These two districts usually furnish the largest number of deaths. The lowest rates were returned from Ganjam (·4), Salem (·4) and Anantapur (·3). The largest number of deaths occurred in January, the smallest number in April. In the municipal towns the average death-rate was 3·4, while the district rate for the presidency was only ·8 per 1,000. Bimlipatam has the highest death-rate, 10·7, and next comes Tanjore with a death-rate of 8·3. The lowest rate was registered in Dindigul and Vaniyambadi; in both these towns the mortality was ·3 per 1,000.

The total number of deaths which occurred under the heading dysentery and diarrhœa in Coorg was 289, the death-rate was 1·67 per 1,000 against 1·47, the mean ratio of the previous five years. As usual the largest number of deaths occurred during the monsoon months.

During 1892, in Bombay, 35,406 deaths were attributed to dysentery and diarrhœa, and the ratio of deaths was 1·88 against 2·00 per 1,000 in the previous year. These diseases were especially prevalent in the Southern and Western registration districts, which returned death-rates, respectively, of 4·37 and 2·56 per 1,000. In the Collectorates the highest mortality occurred in Belgaum (5·95) and Dharwar (4·97), and the lowest in Hyderabad (·06) and Thar and Parkar (·06). The maximum mortality occurred in August, the minimum in February.

Under this head 5,449 deaths were registered in Lower Burma, and the death-rate was 1·21 per 1,000, against ·91 last year, and 1·01 the mean of the previous five years. The districts of the Arakan division show the highest ratios of mortality, Sandoway, 3·10, Kyaukpyu, 2·77, and Akyab, 2·42. The lowest rate, ·30, was returned from Henzada. Of the towns, Bassein (7·16), Myanaung (4·74), Toungoo (4·37) and Akyab (3·37), had the highest death-rates.

Injuries. The total number of deaths recorded under the heading "injuries" for the whole of India in 1892 was 85,950, against 88,933 in 1891, and 87,264 in 1890. But, notwithstanding this decrease, the mortality, as compared with 1891, was greater in Assam, the Punjab, Berar, Lower Burma, Madras, Mysore, and Coorg. The diminution in the total number referred to above was almost evenly distributed under the several sub-heads embraced by "Injuries."

All other causes. The number of deaths from "all other causes," which rose from 1,086,586 in 1890 to 1,109,512 in 1891, was no less than 1,210,268 in 1892; and all the provinces contributed to this increase excepting the Central Provinces, Berar and Madras.

Vaccination.

The total number of successful vaccine operations performed in 1892–93 was 6,239,659 against 5,712,508 in 1891–92, and 5,812,829 in 1890–91. This increase was very generally distributed; only from the Central Provinces was a diminution in the number of successful cases reported. The highest average number of vaccinations performed by each vaccinator was 3,316 in Berar, and the lowest 632 in Bengal. The percentage of success in primary cases, returned from Burma, was exceptionally low, viz., 86·65 in Lower Burma, and 86·09 in Upper Burma. In the other provinces it was nowhere less than 92·43. The highest ratio of success in any province was 99·45 in Bengal. In the case of re-vaccinations, the percentage of success ranged between 24·8 in Berar, and 84·27 in the Central Provinces. The lowest proportion of persons successfully vaccinated per 1,000 of population was recorded in Upper Burma, 19·29, and the highest, 63·80, in Coorg; the next highest figures being 37 in Berar, 34·25 in the Central Provinces, and 33·25 in the Punjab. In both the Punjab and Berar, where there was an undue increase in the number of re-vaccinations, the number of infants protected was less than in 1891–92, but estimating the births at 40 per 1,000 of population, the ratio of successful operations among infants would appear to be respectively 50·5 and 66·4, a result which, compared with results in other provinces, cannot be

considered unsatisfactory. In addition to the operations carried on by the special establishment, 156,823 successful vaccinations were performed by the dispensary staff, against 170,175 in 1891–92. This falling off was mainly due to the dispensary establishment being relieved of the vaccination work in Berar, and to the selection of dispensaries as vaccination centres in Burma, so that the cases in such dispensaries are not performed by the dispensary staff.

The vaccination establishment of the Province of Bengal was re-organized in 1892–93. Under the new system every Civil Surgeon is held responsible for the protection of his district from small-pox. He uses his own discretion as to the number of vaccinators it is necessary to employ, and is allowed the assistance of an Inspector and a Sub-inspector to supervise the work of the vaccinators. According to this new scheme the total number of inspecting officers was 259, and of vaccinators 3,045. They performed in all 1,836,411 operations, of which 1,812,259 were successful; in 1891–92 the corresponding figures were 1,641,088 and 1,614,501. The average number operated on by each vaccinator in 1892–93 was 603 against 599 in 1891–92. The death-rate from small-pox in 1892 (0·31) was greater than in any of the preceding 10 years; and the proportion of persons successfully vaccinated (24·52 per 1,000) though somewhat greater than the ratio of 1891 (22·63) was less than in any of the 12 years, 1879–90.

The total number of operations in Assam in 1892–93, including those performed by the dispensary officials, was 214,402 against 197,147 in 1891–92. Of these the operations carried on by the paid and licensed vaccinators and also some native inspectors numbered 200,241, out of which 190,117 were primary cases, and 10,124 were re-vaccinations, the percentages of success being respectively 94·53 and 83·17. Of the dispensary operations, 13,438 were primary cases, successes 81·75 per cent., and 723 were re-vaccinations, of which 86·30 out of each 100 proved successful. In addition to these, 10,541 operations were performed in the tea gardens by garden agency. All of these were primary vaccinations, and the ratio of success in them was at the rate of 79·48 per cent. The average number of vaccinators employed rose from 205 in 1891–92 to 216 in 1892–93; and the percentage of successful primary operations among infants under one year of age to the total number of births stood at 26·89 as compared with 15·50 in 1891–92, and 11·69 in 1890–91. The mortality from small-pox (0·29) was less than in the preceding four years, and the proportion of people protected by vaccination (31·51) was greater than in any year since 1877. The compulsory vaccination Act was in force in nine municipalities and one cantonment, but its provisions are not apparently enforced with strictness: for instance, while at Dhubri with a population of 4,825 persons, the number of vaccinations was 248, in Goalpara, with a population of 5,440 persons no more than 83 persons were operated on by the vaccinators.

The bovine vaccine depôt at Shillong is reported to have worked well, but the evidence as to the comparative efficacy of the "glycerine" or the "lanoline" preserved lymph is somewhat conflicting. Reports from the local Sanitary Commissioner stated that the lymph preserved in glycerine was "much better" than that preserved in lanoline; whereas during the course of a recent tour of inspection in Assam made by the Sanitary Commissioner with the Government of India, he ascertained that while the "glycerine" lymph got from Shillong failed and led to delay in establishing vaccination, the "lanoline" lymph from Darjeeling was very successful.

The number of vaccinators employed in the North-Western Provinces and Oudh rose from 770 in 1891–92, to 824 in 1892–93, and the total number of operations from 1,059,981 to 1,112,117. There was also a slight increase in the percentage of successful cases, which rose from 91·66 to 92·43 in primary vaccinations, and from 54·73 to 56·50 in re-vaccinations. The proportion of persons protected by vaccination in the province, 20·34 per 1,000, though somewhat greater than the ratio for the preceding year, 19·10, is still low as compared with most other provinces. The number of successful primary operations among children under one year of age increased from 378,512 in 1891–92, to 424,016 in 1892–93, and among those under six years of age from 432,777 to 452,993. The death-rate from small-pox (0·16) has not been so low as in the year under review since 1877, and the proportion of persons protected by vaccination (20·34) in 1892–93 is the highest on record. Vaccination with calf lymph was practised to a certain extent in the 2nd and 3rd circles, but the Sanitary Commissioner remarks "there is reason to believe that the extension of the use of preserved "lymph as opposed to fresh lymph derived in the arm-to-arm system, would lessen "the amount of protection against small-pox which is at present afforded by "vaccination."

In noticing the statistics of the Punjab for 1891–92 it was remarked that in consequence of an order forbidding the practice of unnecessary and repeated re-vaccinations at short intervals there was a marked decrease in the total number of such operations during that year; in 1892–93, however, the number rose to 251,108, or 61,015 more than in the preceding year. But on the other hand, the total number of primary operations, 564,975, was not only less than the figures for 1891–92, when it was 611,576, but also less than the total for 1890–91, viz., 588,416. This is stated to have been chiefly due to the unhealthiness of the year, and also partly to the failure of the lymph supply and the carelessness of some of the vaccinators. There has been a steady increase in the use of animal lymph by the Vaccination Department of this Province. In 1892–93 93 per cent. of the total operations were performed with this lymph against 86 in 1891–92 and 68 in 1890–91. The mortality from small-pox was 0·54, and the ratio of successful vaccinations per 1,000 of population 33·25.

As compared with 1891–92, the Provincial Vaccination Staff of the Central Provinces was less by one man, and the total number of operations fell from 445,720 to 435,410, but the ratio of success in primary cases rose from 96·40 to 96·68, and in re-vaccinations from 79·57 to 84·27. The decrease in the number vaccinated is said to have been partly due to the introduction of the new system of animal vaccination and partly to remissness on the part of some of the vaccinators. It is however, satisfactory to observe that of children under one year of age, 248,315 were successfully vaccinated in 1892-93 against 239,951 in 1891–92. On the whole, the proportion of persons successfully vaccinated per 1,000 of population fell from 38·25 to 34·25, but with regard to this it should be remembered that the ratio of 1891–92 was calculated on the census figures of 1881, which are much less than those of 1891. In addition to the numbers vaccinated by the vaccination staff, 18,436 operations were performed by the dispensary establishments against 17,526 in 1891–92; and the percentages of success in these were 92·09 in primary cases and 70·67 in re-vaccinations against 91·86 and 63·03, respectively, in the previous year. Considerable progress was made in the introduction of animal vaccination in the Province. Although the small-pox mortality in 1892 (0·10) was slightly greater than in 1891 (0·08), yet it was much less than in any of the 14 years preceding 1891.

The vaccination establishment of the Province of Berar was strengthened by the addition of two vaccinators during the year under report, and the proportion of persons protected rose from 36·0 in 1891–92 to 37·0 in 1892–93. The total number of operations was 145,882 or 17,026 more than in the preceding year, but this excess was to a large extent due to increase in the number of re-vaccinations during the year. The important events of the year were the transfer of the work of vaccination from the dispensary establishment to the provincial special vaccination establishment, and the introduction of vaccination into Melghat. The mortality from small-pox (0·02) was somewhat greater than in the preceding year, but it was less as compared with that of any year since 1885.

The total number of operations performed by the special establishment of Coorg was 11,851 against 10,430 in 1891–92, and the average number performed by each vaccinator was 1,317 against 1,159 in the previous year. The percentage of success in primary cases was at the rate of 94·25 and in re-vaccinations at 81·35 against 93·15 and 89·38 respectively in 1891–92.

Although the number of vaccinators in Lower Burma was less by one than in the preceding year, the total number of operations rose from 129,509 to 156,116, and the average number vaccinated by each vaccinator from 1,962 to 2,402. The percentage of success in primary cases was 86·65 and in re-vaccinations 47·79 against 85·21 and 57·19 respectively in the preceding year. Although the mortality from small-pox (0·32) was greater than in 1891 (0·29), yet with the exception of 1889, the proportion of those protected from that disease (25·79) was greater during the year under report than in any other year since 1877. There has been a steady falling off in the number of dispensary vaccinations in the past two years, but this is said to be due to the selection of dispensaries as vaccination centres according to the rules framed under the Vaccination Act, and the consequent entry of their vaccination operations in the general returns. In 1892–93 the number of these operations amounted to only 830, with 81·36 per cent. of success in primary cases and 50 per cent in re-vaccinations.

The total number of operations performed in Upper Burma during the year was 77,991 or 20,006 more than in 1891–92, and 40,035 more than in 1890–91. This increase was widely distributed: out of the 21 districts in the province in only four were the operations fewer in number than in the preceding year. The percentage of

success in primary cases was 86·09, and in re-vaccinations 73·61 against 85·74 and 70·76 respectively in 1891–92. In addition to the above 2,164 operations were performed by the dispensary officials; in these the ratio of success in primary cases was 81·72, and in re-vaccinations 86·30. The ratio of persons successfully vaccinated per 1,000 of population was 19·29 against 14·37 in the previous year.

Notwithstanding the addition of three Superintendents, one Inspector, three Assistant Superintendents, and 17 Vaccinators to the Vaccination Establishment of Bombay Presidency, the total number of operations performed during 1892–93 fell to 986,758 from 998,065 in 1891–92. This failing off is said to have been mainly due to the prevalence of fever and cholera and to scarcity. The percentage of success in primary cases was 94·64 against 94·95 in 1891–92, and in re-vaccination 58·80 against 62·14. The ratio of persons successfully vaccinated per 1,000 of population also fell from 31·78 in the preceding year to 30·71 in the year under report. These results are hardly satisfactory, especially when the number of small-pox deaths in 1892 amounted to 2,770 or 0·15 per 1,000 against 1,491 or 0·08 in 1891.

There was an accession of nine Vaccinators and one second class Deputy Inspector to the vaccination staff of the Presidency of Madras, and the total number of operations, including those performed by dispensary officials, increased by 111,121. The proportion of success in primary cases was 95·2 per cent. against 93·6 in 1891–92, and in re-vaccinations 78·5 against 76·2. The ratio of persons successfully vaccinated per 1,000 of population was 28·7. The returns of previous years show that there has been a fairly steady increase in the proportion of the people protected by vaccination. The results of the working of the department appear, however, to admit of great improvement, especially in the districts of Tanjore, Godavari, Ganjam, Anantapur, and Vizagapatam. It is reported that the use of glycerine paste proved more successful than any other kind of preserved animal lymph, but it was inferior to lymph taken direct from the calf.

Sanitary Works—Military.

The total outlay on Military Works executed during 1892–93 amounted to Rs. 90,88,203, or 7,43,949 less than in the preceding year. The details of the various works on which the above amount was spent are not yet available.

Civil Sanitary Works.

In 1892 the income of the 145 municipalities of Bengal, added to the balance from 1891, amounted to Rs. 34,51,618, and of this sum 5·04 per cent. was spent on original sanitary works, and 37·79 per cent. on sanitary works of an annually recurring nature. On three heads of expenditure—Conservancy, Drainage, and Water-supply—Rs. 10,08,058 were spent against Rs. 9,07,220 in 1891. The increase on account of Conservancy was Rs. 58,356, on account of Drainage Rs. 3,868, and on Water-supply Rs. 38,614. Many improvements in the interests of the public health were made in the province during the year at the expense of public funds and of private liberality. The most important work was the construction of waterworks at Nasirabad by Raja Surya Kanto Acharji, Bahadur, at a cost of Rs. 1,42,764. In all municipalities night-soil is now trenched, but the system is not yet completely carried out, as in most municipalities sufficient attention is not given to the cropping of the land. The following were among the more important matters considered by the Sanitary Board during the year; it is satisfactory to note that in some cases work is being carried on:—

(1.) Drainage of Dinajpur.
(2.) Preparation of internal drainage scheme for Jamalpur.
(3.) Improvement to the water-supply of, and a drainage scheme for, Pubna.

An attempt was made to induce the municipality of Monghyr to combine with the East Indian Railway Company, in their action to secure water for their locomotive shops at Jamalpur, and so obtain a supply of filtered water at Monghyr. It is feared that the municipality are not disposed to incur the expense.

The total income of the 20 municipalities of Assam in 1892 was Rs. 1,89,956, against Rs. 1,73,340 in 1891, and of this 60·31 per cent. was expended on sanitary and other works, including roads and bridges, against 54·74 of the total so spent last year. About one-seventh was expended on water-supply and a little over one-fourth on conservancy. No work of special importance was carried out during the year, but attention was given to the improvement of conservancy in the municipalities and the increase and improvement of water-supply.

The Sanitary Board seems to have considered the improvement of the water-supply of villages and particularly village conservancy.

In the North-Western Provinces and Oudh the following are the more important sanitary improvements begun or completed during the year :—

(1.) The completion of the Benares Waterworks, which were opened on the 18th of November by the Lieutenant-Governor.

(2.) The water-supply projects of Cawnpore and Lucknow were sanctioned; considerable progress was made in the works at Cawnpore, and in Lucknow work was begun.

(3.) Minor waterworks were completed at Haldwani and Naini Tal, and schemes for improved water-supplies for Mussoorie, Rajpur, Dehra, and elsewhere were in progress or proposed.

(4.) A scheme to supply the City and Cantonment of Meerut with good potable water was proposed, and reports were called for towards the end of the year.

(5.) At Benares sanction to proceed with an extensive drainage and sewerage project was accorded.

(6.) At Naini Tal the drainage and sewerage scheme was nearly completed.

(7.) The Kali Barhganga drainage scheme was completed.

The question of the reconstitution of the Sanitary Board was before the Local Government during the year, but final orders on the subject have not yet issued. For some time past the Board has had under consideration the more urgent projects for the relief of obstructed drainage in certain tracts, and the question of carrying into effect the North-Western Provinces and Oudh Village Sanitation Act (Act II. of 1892) has been referred to them for consideration.

"An Act for the licensing, inspection, and regulation of Lodging-houses in Municipalities in the North-Western Provinces and Oudh" (Act I. of 1892) was passed and became law on the 19th of January 1893.

A committee was appointed by Government to advise on the remedies to be employed to prevent the pollution of the sacred pool at Hardwar, to report on the practicability of providing Hardwar with a supply of pure drinking water, to formulate regulations for the prevention of overcrowding, and to make suggestions for the health, comfort, and convenience of pilgrims at future fairs.

The income of the municipal towns of the Punjab, in 1892, amounted to Rs. 44,46,572, and the expenditure on sanitary works was Rs. 14,72,431, or Rs. 2,67,662 more than last year. The expenditure on water-supply, including the cleaning of tanks, was Rs. 5,86,041, as compared with Rs. 3,41,618 in 1891, and the amount spent on drainage and sewerage was Rs. 1,29,853 against Rs. 1,17,479. The sum realised by the sale of manure and town sweepings continues to increase, and in the year under report was Rs. 1,28,804. The waterworks at Delhi were completed and were formally opened by the Lieutenant-Governor in November. A part of the Delhi drainage scheme has been sanctioned, and a loan promised by Government to carry out the project. At Simla rapid progress was being made with the schemes for the extension of the waterworks and improvements in the sewerage. The Abbottabad waterworks were completed. Rapid progress was made in the water-supply works of the town and cantonment of Kohat. The Murree water-supply project was in progress, while schemes for the supply of water to the cities of Umballa, Amritsar, and Mooltan, were under consideration. Projects for the drainage of Anarkalli and Dera Ghazi Khan were submitted to Government for sanction. The intra-mural drainage works at Gujranwala were nearly finished, and at Kohat the drainage scheme was completed. There was great improvement effected in the drainage of Peshawar, while schemes for the drainage of Ferozepore, Rawalpindi, and Muzaffargarh were under consideration. The Sanitary Board met six times during the year. They considered and recommended the adoption of improvements in the rules for the collection of vital statistics, which were approved by Government. They had under consideration projects for the better drainage of the water-logged tracts in the province, besides various sanitary schemes of minor importance. After considering the suggestion in the memorandum of the Army Sanitary Commission on the report of the Sanitary Commissioner of the Punjab for 1890, that the addition of a special engineer to the Sanitary Board would be a very valuable assistance, the Board represented the matter to Government, and recommended that a first-class executive or superintending engineer should be appointed to the Board, and should give his whole time to the initiation and supervision of sanitary works.

The total income of the 19 municipalities of the Central Provinces in 1892 was Rs. 16,66,969, and of this 19·04 per cent., or Rs. 3,17,470, was spent on sanitation, including Rs. 62,753 spent on medical relief. Of the total, 11·43 per cent. was spent on conservancy, 0·23 per cent. on drainage, and 2·47 per cent. on water-supply.

The most important of the sanitary works completed or under consideration were the following:—

(1.) *The Balram Dass Waterworks, Raipur.*—In March 1892 an estimate amounting to Rs. 3,48,691 was sanctioned. Owing to the situation of the town of Raipur a gravitation scheme was found to be impossible. The water is collected in underground galleries on the right bank of the river Karoon from the percolation stream which attends the river. The river bed is the filter, and the water is pumped up through a rising main, 3½ miles in length, to an expense reservoir 134½ feet above the pumping station, and at a sufficiently high level to command the town, civil station, and military lines. The works were opened by the Chief Commissioner on the 30th December 1892. The results are excellent.

(2.) *The Rajnandgaon Waterworks.*—An estimate amounting to Rs. 1,89,365 for this scheme, which is on the same lines as the Raipur project, was sanctioned.

(3.) *The Burhanpur Waterworks* were improved, the estimated cost being Rs. 1,41,279.

(4.) *Nagpur water-supply* improved by laying a second main from Ambajheri reservoir to the pumping station, fencing in a portion of the reservoir area, and removing a small village, which was bought up.

(5.) *Harda Waterworks.*—Survey completed.

(6.) *Khandwa Waterworks.*—Survey completed.

(7.) *Drainage surveys* were carried out for the towns of Nagpur, Jubbulpore, Saugor, Bilaspur, and Sambalpur.

The Sanitary Board were chiefly occupied with village sanitation. In many villages the water-supply was improved by the construction of new wells and the renewal of old, and especial attention was given to the provision of pure water for the lower castes. Many villages were properly drained, and the sites of others cleansed under the direction of the Board.

The income of the eight municipalities in Berar, in 1892, was Rs. 2,22,152, of which 61·1 per cent. was expended upon sanitary works. Great attention was paid to conservancy, and night-soil is trenched in all the municipalities. Although cultivation has been begun in most, it is to be feared that some time must elapse before this will be remunerative, as local caste prejudices are strong against the use of night-soil as manure. Considerable sums have been expended on the improvement of the Akola water-supply at Kapsi. The works were in progress during the year, and when completed will give an abundant supply of good, wholesome water. A complete system of drainage for the city of Amraoti was considered, and work will be begun as soon as funds are available. Not including municipalities, the total expenditure on works of sanitary improvements was Rs. 1,48,571, chiefly incurred on village conservancy, the construction and up-keep of wells, &c. The district sanitary boards assembled once in the year at each headquarter station, and were chiefly occupied in projects for the improvement of the sanitary state of villages. Village sanitary boards have not, so far, proved to be very useful.

The total estimated receipts of the towns in Madras in 1892–93 was Rs. 25,51,800. Of this amount Rs. 15,39,485, or 60·3 per cent., was assigned for expenditure on sanitation, and during the first nine months of the year Rs. 7,85,927 were actually spent for this purpose. The works undertaken and carried out during the year consisted in the sinking and repairing of wells, construction and repair of tanks, latrines, drains, dust-bins, &c. No work of especial importance seems to have been carried out. In 10 municipalities the trenching of night-soil and the subsequent cultivation of the land has been introduced, and "is likely to become popular and prove a success." The affairs of each district were managed by a board, called the district board, consisting of not less than 24 members, presided over by the Collector. Each district board has subordinate to it a number of *Taluq* boards and union *Panchayats*. The total estimated income of the districts in 1892–93 was Rs. 79,04,903, of which 8 per cent. was allotted for sanitary purposes. During the first nine months of the year a little more than half of the allotment was utilised.

In Coorg, in 1892, Rs. 21,078 were spent on sanitary works; a considerable amount of this was spent on road making and other works not directly connected with

sanitation; but a good deal was spent on the construction and repair of wells. Most of the money, however, Rs. 15,208, was expended on the water-works at Merkara, which, it is hoped, when completed, will give the town an excellent and abundant supply. The Sanitary Board met five times during the year.

In Bombay, in 1892, the chief features of the year in the direction of sanitary improvement seem to have been (1) the sewerage at Ahmedabad; sewers have been laid in one section of the town and house connexions were made, the liquid sewage is pumped up to a sewage farm: (2) arrangements to supply the city of Surat with water from wells or galleries sunk near the river at Warucha: (3) experiments to discover a source of pure water for Broach: and (4) the extension of the water-supply, and the preparation of a drainage scheme for Poona, which are still under consideration. The Sanitary Board entered on their duties on the 23rd of January, and the members arranged to travel on inspection duty together. The following are the more important transactions of the Board:—Projects for the water-supply of the following towns were considered, namely, Kalyan, Dakore, Yeola, Nasik, Broach. Surat, Murbad, Shahapur, Barsi, Hubli, and Veramgam. Plans and estimates for the supply of water to the Poona city and cantonment were drawn up by the Sanitary Engineer, and the prospects of supplying Ahmednagar with water were inquired into by that officer. A project for the water-supply of Dharwar was discussed by the Sanitary and Executive Engineers, and the site for a proposed reservoir examined by the Board. Improvements in the water-supply of Kirkee, Sholapur, and Satara were considered by the Board. Reports on the drainage of Sholapur and Pandharpur were made by the Sanitary Engineer; and the advice of the Board concerning the drainage of Dakore, Barsi, Hubli, Nasik and Sirur was given. Plans and estimates for the surface drainage of Belgaum town were approved.

In Burma, in 1892, the total expenditure by the Public Works Department on sanitary works and improvements was, in the Lower Province, Rs. 20,169, including Rs. 8,596 on water-supply, and in the Upper Province Rs. 24,749, including Rs. 15,485 on water-supply. In the absence of sufficient data it is not possible to say what was the total income of the municipalities, nor what proportion was spent on sanitation. Much activity is said to have been displayed throughout the larger towns of the province in the matter of conservancy. In Rangoon the Shone and Ault system of sewerage has been maintained in good working order, and 587 new house connections were made during the year, bringing the total to 1,180. At Rangoon the work of constructing a reservoir in connexion with the Royal Lake was nearly completed. This will not, however, add much to the storage capacity of the lake, and a scheme for extending the Victoria Lake by the erection of bunds, at a cost of about Rs. 1,42,000, was drawn up by the Municipal Engineer. It is calculated that when the extension is completed the area of the lake at the top water level will be 1,010 acres, and the contents 2,820,000,000 gallons of water, and that 25 gallons of water a day per head of population will be available. It was proposed to augment the supply of the lakes by sinking artesian wells, but it appears that this would not suffice to meet the increasing wants of the town. Seven such wells in Rangoon, sunk by private individuals, yield about 100,000 gallons daily. The waterworks at Prome continue to work satisfactorily, and the supply was extended. The water-supply at Akyab was much improved during the year. Artesian borings for water were carried on at Myingyan, Letpadan, and Gyobingauk, but as yet with negative results. Sanction for the sinking of an artesian well at Yamethin was obtained. At Mandalay the water-supply scheme was still under consideration. The number of meetings of the Sanitary Board is not stated in their report, but they seem to have been mainly occupied in considering the surveys of selected towns.

General Remarks.

Quarantine at Camaran.

The Lazaretto at Camaran was opened on the 2nd of February, and the first steamer arrived on the 5th of that month; the last steamer left on the 30th of June. During the Haj season 43 vessels, with 24,015 pilgrims, called at Camaran, against 32 ships with 22,303 pilgrims in 1891. Of the total number of pilgrims 9,719 were natives of India, and 305 were Afghans. There was not a single case of cholera during the season, but there were a few cases of smallpox at Camaran, and some cases of this disease occurred among the pilgrims in the steamers from India. The chief diseases from which the pilgrims suffered were fevers, chest complaints, dysentery and diarrhœa. It is said that there were cases of influenza, but if there were, the

cases were few in number and not severe. The number of deaths was 49 against 76 last year. Water for drinking purposes, although sweet at the beginning of the year, became saltish later on; this was attributed in a measure to the want of rain in May and June. Much inconvenience is suffered by the pilgrims on account of there being no cook-houses. The latrine arrangements are said to be satisfactory. Although the brackish water is believed not to be injurious to health, Her Majesty's Vice-Consul suggests the use in future of condensers which will, he hopes, remove one of the principal causes of complaint on the part of the pilgrims. In April a Committee visited Camaran for the purpose of considering the best means to improve the condition of the lazaretto. They made a number of recommendations, which, if carried out, will remove much of the discomfort endured by the pilgrims during their stay, and will greatly improve the sanitary condition of their surroundings. The Acting Consul at Jeddah points out that while pilgrims from Java are subjected to a quarantine of only five days, Indian pilgrims are invariably detained for ten; he believes that if special arrangements were made for the disinfection of pilgrims and their luggage, and the ships in which they are conveyed, under competent supervision at the principal ports of embarkation in India, that the Board of Health at Constantinople could be induced, through Her Majesty's Ambassador at the Porte, to reduce the term of quarantine for pilgrims from India from ten days to five.

The Haj came to an end without the outbreak of cholera or other epidemic disease.

Researches by the Special Assistant.

The work which has been done during the course of the past year in the laboratory attached to the Office of the Sanitary Commissioner has been almost entirely devoted to an attempt finally to settle the vexed question whether any one specific comma-bacillus is associated with cholera in Calcutta. Full details regarding the investigation are included in a paper which is now passing through the press for the forthcoming number of "Scientific Memoirs by Medical Officers in the Army of India," but the following is a summary of the principal results and conclusions which have been arrived at:—

The evidence which has been gradually accumulated in the laboratory during the course of the past four years appears fully to justify the conclusion that there is no one specific choleraic comma-bacillus. Certain distinct forms of comma-bacilli obtained from cases of cholera have now been in continuous cultivation for nearly four years, and various others for periods ranging from over three years to one year and a half. During the periods in which they have been cultivated they have all been exposed to the influence of precisely like conditions. They have been grown in portions of the same media in the strictest sense, they have been transplanted simultaneously and have been exposed to like conditions of environment during growth, and yet they continue to present well-defined differences. Abundant evidence has been acquired that the majority of them are extremely susceptible to both morphological and physiological modifications under the influence of prolonged exposure to particular environments, and consequently, there are fair grounds for concluding that under the influence of prolonged cultivation under precisely like common conditions any distinctive peculiarities, which were originally present, not as the result of any inherent specific peculiarities, but merely owing to antecedent exposure to unlike conditions, ought to have disappeared. But no tendency to any such general assimilation in the characters of the various forms has manifested itself. Prolonged cultivation under special conditions has certainly in many cases given rise to important modifications of property, but these have not been of a nature to produce any general unification of the various forms; they have not led to the development of any common average form as the result of disappearance of distinctive features. The distinctive features which the various forms now present are not invariably precisely of the same nature as they originally were, which, of course, is only natural in a group of modifiable organisms, but where the original differences have disappeared, equally conspicuous new ones have replaced them. There is thus no scientific ground whatever for the assumption that all the distinct forms of comma-baccilli occurring in connexion with cases of cholera are mere varieties of one species. Taking the facts as they stand, there are no more logical grounds for regarding all the forms of choleraic comma-bacilli as mere varieties, than there are for regarding all schizomycete organisms as such. Any definite relation between the occurrence of cholera and the presence of a particular species of comma-bacillus within the intestinal tract cannot, therefore, be shown to exist, and with this any theory ascribing the choleraic condition to the action of any distinct species of intestinal organism which has yet been

discovered comes to the ground. But, more than this, the induction of the choleraic condition cannot even be ascribed to the action of a group of organisms consisting of the various forms of comma-bacilli which occur within the intestinal tract in cases of the disease, seeing that cases occur in which there is no evidence of the presence of comma-bacilli of any kind whatever.

If the induction of the primary choleraic condition be owing to the action of any organisms growing within the intestinal tract, these have yet to be found. The introduction of large quantities of comma-bacilli into the intestinal tract has never yet been satisfactorily shown to lead to the development of cholera, and comma-bacilli of various kinds frequently abound in the intestinal contents of cases which are unequivocally not of choleraic origin in the ordinary sense of the term. There is thus no evidence to show that any form of comma-bacillus is capable of inducing the choleraic condition if it gain access to the intestinal tract, and there are many facts suggesting that the frequency with which comma-bacilli abound within the intestinal tract in cases of cholera is a consequence, not a cause of the choleraic condition. Even, however, if this be so, even if the prevalence of comma-bacilli within the intestinal tract hold a consequential and not a causal relation to the establishment of the primary choleraic condition, it by no means necessarily follows that they are of no importance. Some forms at all events may be capable of affecting the ultimate course of the disease owing to the nature of the products to which they give rise, and which are liable to enter the system in bulk whenever active intestinal absorption begins to be re-established. The facts as they stand afford no reasonable grounds for supposing that any measures establishing immunity from the toxic effects of the products, which are certainly produced by certain forms of comma-bacilli and other schizomycete organisms, can have any appreciable effect on the prevalence of cholera, but, at the same time, are such as to render it not unlikely that the immunity may be capable of affecting the mortality of the disease.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR MADRAS FOR 1892.

(Surgeon Lieutenant-Colonel J. A. Laing.)

General Population.

The first regular census, which was taken on the night of 14th November 1871, returned the population of the Madras Presidency, excluding the Native States of Travancore, Cochin and Pudukóta, as 31,281,177. In the next census, which was taken on the night of the 17th and on the morning of the 18th February 1881, the population had fallen to 30,868,504, showing a decrease of 412,673. In the last enumeration, however, made on the night of 26th February 1891, the figure rose to 35,677,324. The total area of the Presidency being 141,605 square miles, the average population per square mile is 251·9. Census of 1891.

The most thickly populated district is Madras, where 15,604 persons live in each square mile. Next to this stands Tanjore followed by Malabar, South Arcot and Chingleput. In all these districts the density varied from 600 to 400 per square mile. The most sparsely inhabited tracts of country are Kurnool and the Nílgris.

The total increase for the Presidency was 4,808,820, yielding a percentage of 15·58 on the previous census. In every district there had been an increase, but it varied considerably from 4·59 in Tanjore to 23·71 in Bellary. In 12 districts the rise in population was great, being more than 15 per cent. In only three districts the increase was below 10 per cent.

The record of births and deaths for 1892 does not extend to the whole population as ascertained at the census of 1891. There are some tracts of zemindari estates, &c., for which no vital statistical returns are received. The total population for which returns were furnished in 1892 was 33,693,179, being 1,943,977 short of the total population, viz., 35,637,156, excluding the European and Eurasian population. Vital statistics.

The total births registered during the year 1892 amounted to 845,029 against 924,238 in 1891 showing a decrease of 79,209. Considered with the population they were in the proportion of 25·9 per 1,000 against 27·4 in 1891. As before mentioned these rates have been calculated on the census figures of 1891. The following table shows the births registered during the past 21 years :—

Table showing the Births for a series of years and their ratios per 1,000 *of population.*

Years.	Population for which returns were received.	Births.	Birth-ratio per 1,000.	Deaths.	Death-ratio per 1,000.
1872	30,147,779	543,325	18·02	501,482	16·6
1873	30,287,842	527,363	17·4	506,894	16·4
1874	30,360,221	569,631	18·7	516,848	17·0
1875	30,278,903	625,953	20·6	641,260	21·1
1876	29,157,056	619,748	21·2	680,384	23·3
1877	29,209,542	407,543	16·01	1,556,312	53·2
1878	29,127,205	341,388	11·7	810,921	27·8
1879	28,991,267	467,938	16·1	549,390	18·9
1880	28,778,097	641,769	22·3	454,101	15·7
1881	28,676,375	716,672	24·9	465,682	16·2
1882	28,887,111	743,777	25·7	470,700	16·2
1883	28,503,100	774,754	27·2	541,930	19·0
1884	28,151,952	810,102	28·8	650,335	23·1
1885	28,118,178	807,105	28·7	615,449	21·8
1886	28,043,538	837,077	29·8	553,927	19·7
1887	27,907,840	849,551	30·4	604,775	21·6
1888	27,852,474	833,645	29·9	597,015	21·4
1889	28,050,087	867,523	30·9	661,178	23·5
1890	28,522,313	893,645	31·3	650,394	22·8
1891	33,683,178	924,238	27·4	747,553	22·2
1892	33,693,179	845,029	25·1	750,755	22·3

The figures given in the preceding table show that there was a progressive increase in the number of births registered from 1889 up to 1891, but that in the year under report there was a great diminution in the number of children born. This sudden fall cannot, however, be ascribed to less correct registration in 1892, but must be regarded as the natural result of the distress which prevailed in the Presidency during 1891 and 1892. It is an admitted fact that the fecundity of a population is directly dependent on, and largely influenced by, the general prosperity of the people, and that high prices of articles of food and their insufficiency in quantity and inferiority in quality, even when not carried to the extent of starvation and famine, have a decided effect in lowering the birth-rate. In many parts of the Presidency in both 1891 and 1892, distress prevailed owing to scanty rainfall and the prices of food were in consequence high.

The birth-rates varied in the different districts, ranging from 17·8 per 1,000 of population in Ganjam to 36·8 in Madras. In no district was the birth-rate above 40 per 1,000, in four it was between 30 and 40, in 17 it was between 20 and 30, and in one district, viz , Ganjam, it was below 20 per 1,000. In some districts, which return low birth-rates, registration is defective. A high birth-rate is not peculiar to any one part of the Presidency, but chiefly depends upon the interest taken in this subject by the officials whose duty it is to do so. In all the districts, with the exception of South Canara and Nílgris, the birth-rates were lower than the average for the previous 10 years. Comparing the birth-rates of 1892 with those of 1891 it is observed that in only three districts (Gódávari, South Canara and Tinnevelly) the birth-rates were higher, while in the remaining 19 districts they were lower. The decrease was most marked in the districts of Salem, Chingleput and North Arcot. The highest birth-rates were obtained by Madras (36·8), Bellary (32·5), and South Canara (31·9), and the lowest by Ganjam (17·8), Malabar (20·4), and Vizagapatam (21·5).

As has been before remarked the decrease in the number of births registered may be put down to the distress which prevailed in 1891 and 1892. Although there was a decrease in all the districts, with the exception of three (Gódávari, South Canara and Tinnevelly) in the birth-rates of 1892, when compared with those of 1891, yet those districts in which distress was most severely felt show the greatest diminution in the birth-rate. In nine districts in which relief works were opened the birth-rate fell off considerably, being 25·5 per 1,000 in 1892 or 4·5 less than that obtained for 1891, while in the remaining 13 districts the decrease was very little, the ratio per 1,000 for 1892 being 24·8 or 1·1 less than the ratio for 1891.

Of the 845,029 births registered during 1892 there were 430,997 males and 414,032 females, or in a proportion of 104·0 male to every 100 female births. In 1891 the number of males born to every 100 females was 103·9.

As is generally the case in this Presidency, more births were registered in 1892 during the third and fourth quarters of the year than in the first and second. The highest monthly birth-rate was 2·4, and was recorded for the months of July and October, the lowest (1·8) for the months of February and April. In every month the birth-rates were lower than the averages of 10 years.

As in past years the births exceeded the deaths, but for 1892 the excess was only at the rate of 2·8 per 1,000 of population. In 1890 and 1891 the rates of excess were 8·5 and 5·2 respectively. In 1892 in 15 districts the births registered were more numerous than the deaths, the excess per 1,000 of population ranging from 1·3 in Tanjore district to 9·6 in South Canara district. In seven districts (Cuddapah, Gódávari, Madras, Malabar, Kurnool, Nílgiris and Vizagapatam) there was an excess of deaths over births registered. The greatest excess in the death-rates over the birth-rates was in Madras and Gódávari.

In the year under report the rural birth-rate for the Presidency was lower than the urban, the ratios being 24·9 and 28·3 respectively. This may be attributed not only to registration being better carried on in municipal towns, but also to the distress which prevailed in 1891 and 1892 having been more severely felt among the rural than the town population. Nearly three-fifths of the population depend primarily for their subsistence upon the produce of the soil, so that failure of the monsoons attacks their means of existence, and thus distress ensues, causing a decrease in the number of births. In six districts (Anantapur, Bellary, Kistna, Kurnool, Tanjore and Trichinopoly) the rural birth-rates were higher than the urban, but in the remaining 15 they were lower. In the Ganjam and Malabar districts the difference between rural and urban birth-rates was very marked, the rural birth-rates being 17·3 and 19·7 and the

urban 31·4 and 30·8, respectively. These marked differences are due to the defective state of the registration of births in the rural tracts of these districts.

The total birth-rate for municipal towns is 29·9 per 1,000 for 1892 against 30·0 for 1891. In only two towns in 1892 was the birth-rate above 40 per 1,000, in 33 it was between 30 and 40, and in 20 it was between 20 and 30. The rates in the various municipalities varied, ranging from 20·9 per 1,000 in Vizianagram and Trichinopoly to 41·3 in Vániyambádi. The average birth-rate of the 55 municipal towns was 5·1 higher than the district rate. In only nine municipalities (Bellary, Bezwada, Masulipatam, Mannárgudi, Kumbakónam, Tanjore, Negapatam, Trichinopoly and Vizianagram) the birth-rates were lower than the district rate. In some towns registration of births is still carried on in an inefficient manner, but, on the whole, there has been found, on personal inspection, evidence of improvement.

In a population of 33,693,179, for which returns were received, the deaths numbered 750,755, being at the rate of 22·3 per 1,000 of population against 22·2 per 1,000 in 1891 and 19·5, the average of five years. The year under report was an unhealthy one, the death-rate being higher than any rate that has been recorded since 1878, and being chiefly due to the exceptional amount of mortality registered under "fevers." The following abstract shows the chief causes of death during 1892 compared with the results of the previous 20 years:—

Years.	Total Deaths.	Cholera.	Small-pox.	Fevers.	Bowel Complaints.	Injuries.	Other Causes.
1872	501,482	13,247	39,074	214,148	39,387	15,150	180,476
1873	506,894	840	51,784	222,843	36,392	14,251	180,784
1874	516,848	313	48,343	226,220	37,993	13,065	190,914
1875	641,260	94,546	24,775	252,042	37,484	12,421	219,992
1876	680,384	148,193	23,469	230,092	38,176	11,175	229,279
1877	1,556,312	357,430	88,321	469,241	133,366	16,460	491,494
1878	810,921	47,167	56,360	374,443	48,083	15,007	269,861
1879	549,390	13,296	17,840	285,477	23,218	12,619	196,940
1880	454,101	613	14,529	209,940	19,622	10,845	198,552
1881	465,682	9,446	15,776	203,542	18,961	11,527	206,430
1882	470,700	23,604	20,159	188,561	19,958	11,611	206,807
1883	541,930	36,284	37,975	203,786	22,098	11,509	230,278
1884	650,335	75,476	61,247	215,977	28,775	11,502	257,358
1885	615,449	58,109	34,726	218,786	31,209	11,659	260,960
1886	553,927	12,417	17,129	221,679	27,379	13,103	262,220
1887	604,775	28,389	21,472	240,860	26,679	11,328	276,077
1888	597,015	58,677	21,858	204,561	27,721	11,401	272,797
1889	661,178	76,020	29,138	230,172	29,122	11,506	285,220
1890	650,394	35,288	28,092	262,855	26,608	10,402	287,149
1891	747,553	98,773	41,322	247,029	*34,223	10,542	315,664
1892	750,755	79,033	43,757	280,627	*32,293	11,312	303,733

* Dysentery and diarrrhœa only.

There was an increase in 1892, as compared with the previous year, in the number of deaths registered from fevers, small-pox, and injuries, but a decrease in the deaths recorded under cholera, dysentery, and diarrhœa and other causes.

Of the 750,755 deaths registered, 385,162 occurred among males and 365,593 among females, the annual death-rates per 1,000 of population being 23·1 for males and 21·5 for females. In only four districts the female death-rate was greater than the male death-rate. For every 100 females who died, 105·3 deaths of males were registered, and the proportion varies considerably in some districts.

The mortality amongst infants under one year of age is, as a rule, high. Out of a total death-roll of 750,755, there were 146,948 or 19·6 per cent. of the deaths amongst children under one year of age, and if, as is the rule in England, the death-rate is calculated on the number of children born during the year, it will be found that the death-rate of infants was 173·9 per 1,000. The deaths in children under five years of age formed 34·7 per cent. of the total deaths against 37·3 in 1891. Fewer deaths were registered in 1892 in children under one year than in 1891, and this was doubtless due to a less number of children having been born in 1892. Although a high death-rate among infants is in a great measure due to defective sanitary arrangements, yet there are also several other causes which are to blame for the high mortality, such as the

habits and mode of living of the people themselves and their management of children, unsuitable and insufficient food, early marriages and feeble mothers, &c.

With regard to the influence of sex on mortality, it appears that from infancy up to 15 years of age the death-rate was greater among males than females, but that between 15 and 20 years the death-rate among males was less. From 30 years and upwards females had again the advantage as regards expectation of life.

According to classes the death-rate among Muhammadans was 22·8 per 1,000, amongst Hindus 22·4, amongst Native Christians 16·8, and amongst Other Classes 11·4. The highest rates of Hindu and Muhammadan mortality appear against Madras. In 13 districts (Chingleput, Coimbatore, Cuddapah, Gódávari, Kurnool, Madura, Nellore, Nílgiris, Salem, Tanjore, Tinnevelly, Trichinopoly, and Vizagapatam) no deaths were recorded among Other Classes.

The minimum death period in this Presidency is usually the hottest and driest period of the year (March, April, and May), and the greatest mortality generally occurs in the cold weather, viz., in the months of December and January. The year 1892 was, however, an exceptional one, the highest death-rates occurring in January, July, and August, and the lowest in June, October, and November. The unusual high mortality in the months of July and August was due to the prevalence of cholera in certain districts during these months, especially in the Gódávari, Kistna, Kurnool, Malabar, and Cuddapah districts.

According to districts the highest death-rate (46·5) occurred in Madras and was due to the high death-rate from other causes, fevers, dysentery, and diarrhœa when compared with the ratios of other districts. The death-rate varied greatly in the different districts and, excluding Madras, it ranged from 14·3 per 1,000 in the Ganjam district to 35·1 in the Kurnool district. The low rate returned for Ganjam is due to imperfect registration in parts of this district. The death-rates were lower than the ratios for the previous 10 years in 11 districts (Anantapur, Chingleput, Coimbatore, Ganjam, Madura, North Arcot, Salem, South Arcot, South Canara, Tinnevelly, and Trichinopoly), and in the remaining 11 they were even higher. In 11 districts the death-rates in 1892 were also higher than in 1891 and in 11 lower. The largest increase in the mortality took place in the Vizagapatam district, the death-rate in 1892 being 21·7 per 1,000 of population, while in 1891 it was 12·9. In 1892 greater attention was given to registration in this district, and allowing for this the increase was due to the prevalence of cholera in 1892, and also to many deaths having been registered from fevers and small-pox. In Gódávari district the death-rate in 1892 was also much greater than that of 1891, and was due to a large mortality being recorded under cholera and small-pox. The greatest decrease in the mortality occurred in the South Arcot district, the death-rate for 1892 being 18·8 per 1,000 against 29·6 in 1891, and was mainly due to the deaths registered from cholera and small-pox being much less than those in the preceding year. In Madras there was also a marked decrease in the mortality in 1892, the death-rate in 1892 being 46·5 against 53·1 in 1891, and was chiefly due to the deaths recorded under all other causes, cholera and dysentery and diarrhœa being less than in 1891.

The death-rate in 1892 among the urban population was higher than among the rural, the ratios being 27·6 and 21·9 respectively, against 27·4 and 21·9 in 1891. In all the districts, with the exception of Salem and South Arcot, the urban death-rates were higher than the rural. Judging from the death-rates amongst the rural population, the most unhealthy district in 1892, excluding Madras, was Kurnool, where fevers prevailed to a great extent.

The average death-rate of the 55 municipal towns was 29·4 per 1,000 of population, or 7·5 higher than the district-rate. The ratios varied in the different municipalities, ranging from 18·2 in Salem to 55·2 in Kurnool. The high mortality in Kurnool was due to the prevalence of cholera and fevers, and in Cochin to many deaths having been registered under small-pox and other causes.

Chief Diseases.

Cholera.

In 1892 there was a decrease in the mortality from cholera when compared with 1891, the deaths registered in 1892 having been 79,033, or 19,740 less than the number (98,773) recorded in 1891.

The following table shows the ratios of cholera deaths for the previous 20 years, and for 1892 the death-rate was 2·3 or 0·6 less than that in 1891 :—

Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.	Years.	Ratio of cholera deaths per 1,000 of population.
1872	0·4	1880	0·02	1888	2·1
1873	0·02	1881	0·3	1889	2·7
1874	0·01	1882	0·8	1890	1·2
1875	3·1	1883	1·2	1891	*2·9
1876	5·08	1884	2·7		†3·5
1877	12·2	1885	2·06	1892	2·3
1878	1·6	1886	0·4		
1879	0·4	1887	1·01		

* Calculated on the census population of 1891.
† This is the rate given in the Annual Report for 1891 and was calculated on the census population of 1891.

In no month of the year was cholera absent from the Madras Presidency ; but during the last quarter there was a great decrease in the mortality from this disease. The greatest number of deaths (18,676) was registered in January and the fewest (286) in December. In January deaths from cholera were reported from all the districts with the exception of Bellary, and the number of casualties amounted to 18,676. In February, March, and April there was a progressive decrease, but in May the disease again began to increase, and in July as many as 16,739 deaths were recorded. From August the disease began to decline, and in December deaths from cholera were reported from only 11 districts and amounted, as already stated, to 286 in that month.

In every district in the Presidency deaths from cholera were recorded during the year, and in nine districts (Chingleput, Coimbatore, Cuddapah, Gódávari, Kistna, Kurnool, Madras, Malabar, and Salem) deaths were registered during every month of the year. In ten districts (Ganjam, Gódávari, Kistna, Kurnool, Malabar, Nellore, South Canara, Tanjore, Tinnevelly, and Vizagapatam) the deaths reported were greater than in 1891, and in 12 districts the death-rates were higher than the average of previous five years. The epidemic was most severely felt in the Gódávari, Kurnool, and Tanjore districts, the death-rates per 1,000 of population being 6·5 for Gódávari, 6·0 for Kurnool, and 4·1 for Tanjore.

In the Gódávari district, during the year under report, the number of registered deaths from cholera amounted to 13,618 against 1,496 in the previous year and an average of 3,533 for five previous years. There were some deaths in this district in January, but the disease increased in May, and in July 8,130 deaths were reported. In August there was a decrease, the deaths recorded being 2,296, and in September, October, November, and December the deaths were only 257, 118, 7, and 22 respectively. In 1891 the rainfall was very deficient in this district, only 25·34 inches having been registered against 41·21 in 1890, and 34·71 the average of ten years. In 1892 the rainfall was, however, much above the average, 50·53 inches being registered in that year against 35·75 inches, the average of ten years. In June, July, August, and September the rainfall was above the average, and in October there was an unusual rain, 20·02 inches being registered for that month against an average of 6·16 inches. The District Surgeon reports as follows : "This disease prevailed for " about six months in the year and was exceedingly fatal. Ellore seems to be its " starting point here, being imported from the adjacent Kistna district. On account " of the free canal communication the epidemic soon spreads. It affects primarily " and principally the delta taluks. The chief source of drinking-water in the delta is " the Gódávari and its canals; and these canals are frequently polluted by people " throwing corpses of those dying from cholera and other diseases, thus materially " aiding the spread of the disease."

In the Kurnool district during 1892 there were 4,886 deaths recorded from cholera and is the largest total recorded since 1878. The death-rate from this disease was 6·0 per 1,000. The District Surgeon, in his annual report, states that cholera, "which " was continuing in a sporadic form in the town of Cumbum at the end of the " preceding year, began to increase in severity in the month of January and lingered " on till the month of June, when the disease assumed an epidemic character and " spread throughout the taluk. In the months of July and August the disease was at " its height. In September it began to subside and disappeared in October. In the " month of April cholera appeared in the Markapur taluk, having been introduced " from Cumbum by pilgrims. In May it reached its acme. It then began to decrease

" in severity, and in the month of October it had entirely subsided. In the month of " May cholera of a very virulent type appeared in the town of Nandyal, having been " imported from the Cumbum taluk by a railway passenger, who was carried out " of the train cholera-stricken and sent to the civil dispensary for treatment. It " assumed large dimensions in the months of July and August, and disappeared " by the end of the year. The total number of attacks in the town was 733 with " 391 deaths The disease also appeared in the remaining taluks of the district, but " was of a mild type and calls for no remark. Cholera first appeared in the Kurnool " town in the early part of July, having been imported by a man from Nandyal, where " the disease was prevailing at the time. Several people living in the street where this " man resided were next attacked. It then spread throughout the length and breadth " of the town, and in the month of August it was most virulent, when 77 deaths were " recorded. By the end of September it had entirely disappeared. In August it broke " out in the jail and also appeared amongst the troops (a wing of the 14th M.I. being " stationed here at the time). Three attacks with one death were recorded in the " former and two attacks with two deaths in the latter." With regard to the rainfall of this district there was a great deficiency of rain in 1891, the rainfall for that year being only 15·41 inches against 29·14 for 1890, and 26·44 the average of ten years. In consequence of the deficient rainfall of 1891 there was great scarcity of drinking-water during the beginning of 1892, and many of the supplies were very impure. In 1892 the rainfall was, however, much above the average, 38·96 inches having been registered, against an average of 27·64. In June, July, August, and September the rainfall was above the average, and in October as many as 10·51 inches were registered against an average of 5·07 inches.

The Tanjore district is the next in order of severity, and the number of deaths registered in 1892 was 9,093 against 6,565 in 1891. The disease was very prevalent in January and February, when 4,549 and 1,946 deaths were registered. It then gradually decreased; in June it again increased, but from August it greatly declined, and in December no deaths were recorded as due to cholera. In this district in 1891 the rainfall was about the average, but in 1892 it was very deficient, only 28·68 inches having been registered against an average of 48·43 inches. The rainfall was above the average in June, July, and August, but owing to the failure of the north-east monsoon the rainfall in October, November, and December was much below the average. The District Surgeon reports: " The health of the district during the early " part of the year, viz., from January to August, was not satisfactory in consequence " of the prevalence of cholera in an epidemic form continuing from 1891. During " August the disease abated considerably, and more so in September, when only " 52 deaths occurred throughout the district. In October the figure fell to ten, and in " November to two. There were no deaths in December, " as the disease had entirely subsided. The names of " the taluks that suffered much are given in the margin " with the number of deaths in each taluk. It will be " seen from the statement of mortality attached to this " report that the epidemic of cholera was severe in the " majority of the taluks in the months of January and February 1892; in March " there was a sudden fall in the number of deaths, viz., from 4,550 in January and " 1,946 in February to 532; in April, May, June, and July the mortality ranged " between 600 and 400; and in August it fell down to 106 . . . . . When " cholera was epidemic in any taluk the municipality in that taluk did not escape, and " the disease showed the same signs of exacerbation and abatement in certain months " as already noted above."

Kumbakónam - -	3,669
Tanjore - -	2,281
Nannilam - -	1,403
Máyavaram -	1,248
Negapatam -	1,071
Shiyali - -	1,045

Out of 14,678 villages in the Presidency, 7,840 or 17·5 per cent. were affected by cholera. The highest percentage occurred in the Kurnool district, where, out of 802 villages, 289 or 36·0 per cent. were affected.

In 82 out of 91 towns deaths from cholera were registered, and in the remaining nine no deaths were reported.

Out of a total of 79,033 deaths from cholera for the Presidency 5,116 occurred in municipal towns. In two municipalities, Palni and Ootacamund, no deaths were recorded. The disease affected the urban more than the rural circles, the death-rate being for municipal towns 3·2, or 0·9 more than that of the district. The death-rates of 28 municipal towns exceeded those of the districts, and in 25 towns they were less.

Although many deaths were registered under cholera in 1892 still the year has been one of subsided activity with regard to this disease in the Presidency. No new light

has been thrown upon the etiology of the disease, but there is sufficient evidence to show that insanitary conditions tend to localise cholera, and that the best way of preventing the origin and spread of cholera is to remove all local insanitary conditions and carry out the sanitary measures which are known to be antagonistic to the prevalence of the disease.

Small-pox.

During the year under review there was an increase in the mortality from small-pox, the deaths in 1892 having amounted to 43,757 against 41,322 in 1891. In the Malabar district the disease prevailed with great severity and caused a little over one-fourth of the total deaths.

The number of deaths registered from small-pox in 1892 was 43,757, or 1·3 per 1,000 of population, against 41,322 or 1·2 in 1891.

The largest number of deaths (6,872) occurred in March and the fewest (1,619) in November. The maximum mortality from small-pox in this Presidency is usually attained during the dry months, and the minimum during the rainy months, and it would appear that rainfall is unfavorable to the prevalence of small-pox and drought favourable to the development of the disease. In both 1890 and 1891 the rainfall was deficient and in each year following these there was a great increase in the small-pox mortality.

There were 6,092 children under one year of age, and 14,314 over one and under 12 years of age who died from small-pox in 1892. The largest number of deaths from small-pox occurred, as is usually the case, among infants and children under 12 years of age, 46·6 per cent. of the total mortality being borne by them. Compared with 1890 and 1891 it is found that the proportion of children who died in 1892 was less than in either of the two preceding years.

In all the districts there were deaths registered from small-pox in 1892. In 10 districts (Anantapur, Chingleput, Cuddapah, Kistna, Madras, Madura, North Arcot, South Arcot, Tanjore and Tinnevelly) there was a decrease in the deaths from small-pox in 1892 when contrasted with 1891; in 11 there was an increase and in one (Nílgiris) the number of deaths was the same. Although the mortality from this disease was greater in 1892 than in 1891, yet it will be seen that the increase is chiefly due to the great prevalence of small-pox in the Malabar and Gódávari districts, where 7,320 more deaths were registered in 1892 than in 1891. As regards the excessive death-rate (4·4) in the Malabar district, vaccination has always been opposed by the people, and its practice is carried on under many disadvantages. In this district, the houses, as a rule, are scattered and are not collected together as in other districts forming villages and towns, and the females (whose influence on the household is greater in Malabar than in other parts of the Presidency) are greatly opposed to vaccination. Further the Moplah population is very conservative and ignorant and resist any new practice. The District Surgeon, in his report for 1892, states: "Small-pox which had prevailed in epidemic form throughout 1891, continued throughout 1892, causing great havoc; it was present in virulent form throughout the whole district, causing 10,467 deaths against 5,092 in the previous year; the taluk of Ponáni, with its crowded Moplah population and highly insanitary conditions suffering most; 3,356 persons being registered as having succumbed to the disease in that taluk alone. The greatest mortality for the whole district from this epidemic occurred in the first four months of the year, during which period 7,519 persons are registered as having died. At the close of the year, the epidemic was declining but still existed in all taluks." The lowest death-rate (0·06) was obtained by Madras, and vaccination in this town is carried on in a most satisfactory and efficient manner.

Out of the 55 municipal towns, deaths from small-pox were registered in 47, and in eight towns no deaths were recorded. Cochin heads the list with a ratio of 19·9 per 1,000. Vaccination is not compulsory in Cochin, and the people are greatly opposed to it, and many believe that when small-pox is prevalent, vaccination will cause an attack of small-pox. A large proportion also of the deaths from small-pox were not among the residents of Cochin Municipality, but were among people who came from the neighbouring Native States of Travancore and Cochin to be treated in hospital or among the labourers who work during the season in the yards, &c.

Fevers.

Excluding "other causes" by far the largest number of deaths was recorded as due to "fevers." The number of registered deaths attributed to fevers in 1892 was 280,627 or 33,598 more than in the previous year, and the mortality was greater than in any year since 1879, when 285,477 persons died from fevers. Although the fever death-rate was made higher in some parts of the Presidency owing to deaths from

influenza being recorded under fevers, yet the principal cause of the increased mortality from fevers was no doubt the heavy rainfall that occurred in 1892; and further the impoverished state of a large part of the population, due to the failure of crops and the consequent high prices of food, lowered the condition of the public health and so rendered many of the inhabitants less able to withstand the effects of the insanitary conditions which surround them. The death-rate from fevers in 1892 was 8·3 per 1,000, against 7·3 in 1891, and 7·3, the average of previous five years.

In all the districts, with the exception of Chingleput, Madura, North Arcot, Salem South Arcot, and Trichinopoly, the death-rates from fevers were higher in 1892 than in 1891. The highest death-rate (22·8) occurred, as usually happens, in the Kurnool district, and the lowest (2·2) in the Tanjore district. The rates of fever mortality were also high in the Nílgiris, Cuddapah, Vizagapatam and Madras districts.

The Presidency district rate was 8·4 per 1,000 of population or 1·4 greater than the municipal Presidency rate (7·0). In 23 municipal towns the death-rates were higher than those of the district and in the remaining 32 municipalities they were lower.

Dysentery and diarrhœa.

There were 32,293 deaths recorded under dysentery and diarrhœa in 1892, or 1,930 less than the number (34,223) registered in 1891. The death-rate for 1892 was 1·0. There is no doubt that many of the deaths from dysentery and diarrhœa may be attributed to the people having to resort to unwholesome kinds of food owing to failure of crops and the high prices of food. The district which recorded the highest mortality from dysentery and diarrhœa was Madras, with a death-rate of 8·9 per 1,000, and following it comes Chingleput, with a ratio of 3·2 per 1,000. These two districts usually return the highest death ratios from dysentery and diarrhœa. The lowest ratios were recorded in the Anantapur (0·3), Ganjam (0·4) and Salem (0·4) districts. In eight districts (Bellary, Cuddapah, Ganjam, Godávari, Malabar, Nellore, South Canara, and Vizagapatam) there were more deaths recorded in 1892 than in 1891, while in the remaining 14 they were less. The largest number of deaths (4,481) was recorded in January, and the smallest (1,830) in April.

The district Presidency rate was 0·8 per 1,000 of population, and was 2·6 less than the municipal Presidency rate (3·4). In 51 municipal towns the death-rates were higher than in the districts, and in four they were lower. The highest death-rate in municipal towns from dysentery and diarrhœa is reported to have occurred at Bimlipatam, where it attained the ratio of 10·7, and next to it comes Tanjore with a death-rate of 8·3. The lowest death-rate (0·3) was registered at Dindigul and Vániyambádi.

Injuries.

The deaths registered in 1892 from injuries amounted to 11,312, or 770 more than than the number (10,542) recorded in 1891. The death-rate per 1,000 of population was 0·3 in 1892. There was an increase in the number of deaths registered from suicides and wounds and accidents in 1892 when compared with 1891 and a decrease in the number of deaths from "snake-bite" and "killed by wild beasts." Excluding towns, the death-rates in the various districts only varied from 0·2 per 1,000 of population in the Ganjam district to 0·5 in the Chingleput, Cuddapah, and South Canara districts. As is generally the case, there were more suicides among females than males. The largest number of suicides occurred in Tinnevelly, and in the Nílgiris no deaths from this cause were recorded. There were 7,094 deaths recorded as due to wounds and accidents, and as frequently happens the largest number of deaths occurred in the North Arcot district. Snakes and wild beasts caused 2,098 deaths, the largest number (231) occurring in the Tanjore district.

All other causes.

The registered mortality from "all other causes" in 1892 amounted to 303,733 against 315,664 in 1891, giving a death-rate of 9·0 per 1,000 for the year under report against 9·4 for the preceding year.

Sanitary Works.

Municipalities.

The number of municipalities administered under the District Municipalities Act IV. of 1884 continued the same as in the previous year, viz., 55. The affairs of each municipal town were looked after by a council consisting of not less than 12 members, and presided over by a chairman, in whom the executive administration is vested. In the City of Madras, however, Madras Act I. of 1884, as amended by Acts VII. of 1884 and II. of 1892, was in operation.

Sanitary Works.—The sanitary works executed during the year under report may be brought under one or other of the following heads :—

(*a.*) Sinking, repairing, and cleansing wells, &c. :—
(*b.*) Construction and repair of drains, public latrines, cinerators, dust-bins, markets, slaughter-houses, &c.
(*c.*) Improvement of village-sites, &c.

Detailed information regarding drainage and water-supply works will be found furnished in the report of the Sanitary Engineer printed as Part II. of this volume. As has been pointed out in previous reports the drinking water supplies and drainage of towns remain, as a rule, in a very defective and insanitary condition, and, as often remarked, until they are put in a satisfactory condition a marked decrease in the mortality of our towns cannot be hoped for. In the matter of conservancy there has been improvement in many cases and particulars of the establishments maintained and material employed for conservancy purposes in the various towns show that under all heads, with the exception of "Sweepers, &c.," and "Public latrines," there was an increase in 1892 as compared with 1891. The staff employed in each town worked under the immediate supervision of the chairman assisted by the divisional councillors. In most towns the servants were more closely looked after in 1892, while in a few the control exercised was indifferent or lax. The cleanliness of towns depends not only on the numerical strength of the staff employed but chiefly on the degree of care and interest evinced by the authorities concerned in the cause.

The total estimated receipts of the towns for 1892–93 were Rs. 25,51,800 against Rs. 26,52,995 for the previous year. Of this amount Rs. 15,39,485, or 60·3 per cent., was assigned for expenditure on sanitation, and the actual outlay incurred during he first nine months of that year was Rs. 7,85,927, or 51·1 per cent. In the 41 towns less than 75 per cent. of the allotment was utilised in the period under notice.

District Boards.

The Madras Local Boards Act V. of 1884 was in force in all the districts of the Presidency except Madras, which has an Act of its own (Act I. of 1884 as amended by Acts VII. of 1884 and II. of 1892). The number of districts administered under the above Act was the same as in the previous year, viz., 21, each being conterminous with the corresponding revenue district. The affairs of each district were managed by a Board designated the District Board, consisting of not less than 24 members, presided over by the Collector, who, for purposes of the Act, was styled the President. Each District Board had subordinate to it a number of Taluk Boards and Union Panchayats.

Sanitary Works.—As usual the works undertaken and carried out during the year under report consisted in sinking and repairing wells, construction and repair of tanks, latrines, drains, dust-bins, &c., and improvement of village sites and water supply generally.

Water Supply, Drainage, and Conservancy.—The sources from whence people had their supply of water were as usual either tanks, wells, ponds, rivers, springs, or canals. Over a great many of these sources watchmen were placed to guard them from pollution, and a number of tanks and wells were cleaned and deepened. As regards drainage there had been no change in the system pursued. Side cuttings, chiefly intended to carry off rain water, were the only means whereby villages were drained. Out of an aggregate of 44,622 villages, 910 were conserved against 862 in 1891. Of these, 330 were unions and 580 other villages, the corresponding numbers of the previous year being 272 and 590. As in the previous year Gódávari took the lead, the number of villages conserved being 118, and the Nílgiris brought up the rear.

The total estimated income of the districts for 1892–93 was Rs. 79,04,903 against Rs. 83,04,687 in 1891–92, and of this sum Rs. 6,31,741, or 8 per cent., was allotted for sanitary purposes. During the last nine months of the year 57·4 per cent. of the allotment was utilised. In no less than 14 districts the assignment for sanitation was not fairly worked up to.

General Remarks and Personal Proceedings.

I carried on the duties of Sanitary Commissioner and Surgeon-Major Dymott, those of Inspector of Vaccination and Deputy Sanitary Commissioner throughout the year. I inspected 27 municipal towns and 55 smaller towns and villages during the year, and Surgeon-Major Dymott 24 municipal towns and 73 smaller towns and villages.

Reports on all the municipal towns inspected were submitted to Government and also to the chairmen of municipal councils. In the appendix will be found two tables, one showing the names of the municipalities inspected during the year with dates of inspection, &c., and the other the names of the smaller towns and villages visited. The time I spent on inspection duty was about five months and by the Deputy Sanitary Commissioner five months.

As has been the practice in this Presidency for many years now—since 1879—intimation of my intended visit to municipalities is given, and during my inspections I am accompanied by the chairmen and generally also by some of the municipal councillors. All matters of sanitary interest are then discussed and all defects observed during my inspection are pointed out on the spot and the manner in which they could most easily be remedied is explained. At the same time the birth and death registers are examined and the importance of exercising a careful and strict supervision over this work is explained. Although in places the returns are still inaccurate, yet steady improvement on the whole is being made in the work of registration of births and deaths.

There is no doubt that progress in sanitary matters is being made in most municipalities and that many chairmen and municipal councillors are thoroughly aware of the close relation that exists between the sickness and mortality from which the people annually suffer and the insanitary conditions among which they live, and as far as lies in their power do all that is possible with the means at their disposal to remove existing defects and adopt measures to protect the public health. Many insanitary defects, however, still exist in all towns, and their removal must be a work of time and require a large expenditure of money.

In most municipal towns a supply of good drinking water is much required, and there is also urgent need for comprehensive schemes of drainage. Projects, however, for supplying some towns with wholesome drinking water have been sanctioned and the works are now in progress, while for other municipalities water-supply schemes are being prepared. The drainage of towns is still in a very defective condition and efficient sewerage systems for the quick removal to safe distances outside the towns of the foul matters which now pollute the soil, air and water are urgently required for many places. The percolation of sewage through the soil is one of the most active causes in Indian towns of the impurity of the well water, and in towns which depend on local wells for their supply of drinking water the purification of the ground which efficient works of drainage are capable of doing will result in the purification of the water of wells also. The removal of burial grounds from the midst of inhabited areas has engaged the attention of many municipal councils, but in places it has been met by great opposition, and it is found difficult to alter old established customs (which by many are thought harmless) in the interests of hygiene. The necessity for such a step is evident, for not only do grave-yards cause pollution of the soil, but also of the air and water in their neighbourhood.

With regard to sewage farming it is still carried on in very few places, and, as before remarked, there are no proper drainage systems for towns, and the sewage either sinks into the ground or finds its way into any depression or nullah. The only changes during the year have been the following. The small sewage farm which was started at Salem two years ago has now been abolished, as the owner of the land declined to lease it out. There is a farm in Tanjore adjoining the fort ramparts which is irrigated with sewage. It is 65 acres in extent and is leased out to a contractor for Rs. 1,950 per annum.

In a few municipalities (10) the plan of burying night-soil in shallow trenches and then utilizing the land for cultivation has been introduced and is likely to become popular and prove a success. In Vizagapatam cholum, cumbu, horse gram and vegetables have been grown on land which had been trenched with night-soil with good results.

The question of disposing of refuse unfit for agricultural purposes is one which has been engaging the attention of many councils. As towns increase and grow in density, the safe disposal of street sweepings and other rubbish of small or no manurial value is a matter which requires the careful attention of municipal councils, and it is very necessary that this refuse should be so dealt with that what remains of it after treatment shall be innocuous whatever may be its ultimate destination. On no account should this refuse be used to raise ground or fill up pits, &c., in the midst of inhabited areas or in places where the ground may likely be used for building purposes, and undoubtedly the best way of disposing of this refuse is by fire.

With regard to the progress sanitation is making in villages it is evident from the numerous inspection reports received from the District Medical and Sanitary Officers that sanitary matters are engaging the attention of the district authorities, and that an improvement in the sanitary condition of smaller towns and villages has been and is being effected in all districts. Nearly everywhere efforts are being made to ensure greater surface cleanliness and in many parts the drinking water supplies have been improved. Wells and tanks have been cleansed, repaired and put in a more satisfactory condition and new wells have been constructed.

There were 1,068 places inspected in 1892 against 454 in 1891. Eighty-two places were inspected more than once during the year.

ABSTRACT OF REPORT OF THE SANITARY COMMISSIONER FOR BOMBAY FOR 1892.

(*Dr. C. W. Macrury.*)

General Population.

Vital Statistics.

Regarding the arrangements for testing the record of vital statistics by the vaccination staff, the mode of procedure is as follows: On a vaccinator arriving at a village, the children available for vaccination are collected, their names and ages taken down and the village birth register examined and the names found out. If a name is not in the village register, inquiry is made as to the place of birth. In the case of a child whose name is found in the birth register and not in the death register who has not been produced, inquiry is made as to why the child has not been brought forward. A list of the discrepancies found out is drawn up and sent to the Deputy Sanitary Commissioner, who forwards it on to the Collector of the district by whom further inquiry is made, and, if necessary, steps are taken to ensure more accuracy.

In the Presidency of Bombay, including Sind, during the year 1892 there were 650,667 births registered against 682,677 in 1891. The recorded births for the year under report were thus 32,010 less than the number registered in the previous year, but exceeded the mean of the preceding 10 years ending 1891 by 63,765. By sexes there were 337,150 males and 313,517 females against 354,630 and 328,047 respectively in 1891.

The following table shows the number of births registered in each year from 1882 to 1892, their ratios per 1,000 of population, and the proportion of males to females:—

Years.	Population.	Number of Births Registered.			Ratio per 1,000 of Population.			In every 100 Births there were		For every 100 Male Births the Females were
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	
1882 - - -	16,454,414	255,927	235,419	491,346	15·55	14·31	29·86	52·09	47·90	91·98
1883 - - -	16,454,414	261,966	239,835	501,801	15·92	14·58	30·50	52·20	47·80	91·55
1884 - - -	16,454,414	278,986	255,737	534,723	16·96	15·54	32·50	52·17	47·83	91·67
1885 - - -	16,454,414	298,406	274,025	572,431	18·14	16·65	34·79	52·13	47·87	91·83
1886 - - -	16,454,414	303,376	278,177	581,553	18·44	16·90	35·34	52·17	47·83	91·69
1887 - - -	16,454,414	327,500	300,693	628,193	19·90	18·27	38·18	52·13	47·87	91·81
1888 - - -	16,454,414	330,316	304,377	634,693	20·07	18·50	38·57	52·04	47·96	92·15
1889 - - -	16,454,414	312,974	287,515	600,489	19·02	17·47	36·49	52·12	47·88	91·87
1890 - - -	16,454,414	333,698	307,417	641,115	20·28	18·68	38·97	52·05	47·95	92·14
1891 - - -	18,820,346	354,630	328,047	682,677	18·84	17·43	36·27	51·95	48·05	92·50
Mean for 10 years	16,691,007	305,778	281,124	586,902	18·32	16·84	35·16	52·10	47·90	91·94
1892 - - -	18,820,346	337,150	313,517	650,667	17·91	16·66	34·57	51·82	48·18	92·99

The recorded birth-rate for the year was 34·57 per 1,000 of population against 36·27 in 1891, and a mean of 35·16 for the previous 10 years.

By months the greatest number of births (61,727) was registered in June, and the least (47,699) in February. In 1891 the highest and lowest numbers (62,408) and (49,645) respectively were registered in the months of June and January.

Of the 24 collectorates, the number of recorded births in 1892 was higher than in 1891 in the collectorates of Násik, Thána, Kolába, Ratnágiri and Kánara. The remaining collectorates show a decrease as compared with 1891. The registration of births throughout the Province of Sind is defective, especially in Thar and Párkar and Hyderabad collectorates. The City of Bombay shows practically the same recorded birth-rate (18·87 per 1,000) as last year, and is less than the mean of the past 10 years, which is 19·47 per 1,000, a very low figure.

The recorded birth-rates among the urban and rural populations of the Presidency were respectively 28·24 and 35·46 against 28·63 and 37·34 in 1891. Except in the collectorates of Ahmednagar, Ratnágiri, Dhárwár, Bijápur, Karáchi, Hyderabad, Thar

and Párkar and Shikárpur, the birth-rates were higher amongst the rural than in the urban population. It was the same in 1891, except in Ratnágiri, Bijápur, Kánara, Karáchi, Hyderabad, Shikárpur, and Upper Sind Frontier. In the collectorate of Kánara the birth-rates among the rural and urban populations were 31·00 and 31·66 per 1,000 respectively.

Out of 56 towns in the Presidency 14 had a birth-rate exceeding 40 per 1,000. Attention has been repeatedly drawn to the low birth-rate shown by such towns as Thána, Mahád, Bombay, Alibág, Kalyán, and Násik. Progress has been made, but at a slow rate, and much more attention is required to this important point. Kalyán, owing to some changes in municipal management, shows this year a great advance, from 13·24 in 1891 to 23·08 in 1892, and it is hoped that this will be continuous.

Among the civil population in the rural, town and cantonment circles in the Presidency, 611,742 deaths were registered during the year 1892. In 1891, 513,132 deaths, or 98,610 less than in 1892, were recorded. The year was unhealthy, and from the following causes:—In the early part of the year the influenza, which prevailed during the latter part of 1891, still continued in Sind and Gujarát. There was also great scarcity in parts of the Southern District in the first half of the year. Then in April cholera began and prevailed all over the Presidency, reaching its maximum in July. Heavy rain in the month of September caused an outbreak of fever, most noticeable in Gujarát.

The following statement shows the number of deaths recorded in each year since 1882:—

1882	- -	343,418	1886	- -	381,185	1890	- -	463,616
1883	- -	420,198	1887	- -	455,261	1891	- -	513,132
1884	- -	408,409	1888	- -	468,039	1892	- -	611,742
1885	- -	473,591	1889	- -	518,562			

Of the total deaths registered, 317,031 occurred among males, and 294,711 among females, against 267,282 and 245,850 respectively in 1891.

The computed death-rate per 1,000 of population in 1892 was 32·50 against 27·26 in 1891, and a decennial mean of 26·63. The millesimal ratio of males dying to males living was 32·56, and of females dying to females living 32·45. In 1891 these ratios were respectively 27·46 and 27·07. For every 100 females who died 107·57 deaths among males were recorded, but these proportions varied considerably in the following collectorates:—

In Kánara the ratio of male to female deaths was			115·54 per cent.
„ Broach	do.	do.	110·96 „
„ Kaira	do.	do.	114·62 „
„ Karáchi	do.	do.	119·31 „
„ Hyderhabad	do.	do.	121·69 „
„ Thar and Párkar	do.	do.	120·60 „
„ Shikárpur	do.	do.	113·46 „

In 1892 the recorded death-rates per 1,000 of population were lower than in 1891 in the collectorates of Khándesh, Násik, Ahmednagar, Sholápur, Bijápur and Broach. A large increase in the death-rate occurred in the collectorates of Belgaum and Dhárwár, in the Sind District and the Gujarát District, except Broach. In Sind the increase was due to cholera and fever, and in Broach the increase was almost entirely due to deaths returned under the head "fever." The recorded death-rate per 1,000 of population in 1892 was higher than the annual mean of the preceding 10 years in all the collectorates except Khándesh, Sholápur, and Bijápur. The death-rate (25·94 per 1,000 of population) in Thána was nearly the same as that of the annual mean of the preceding 10 years (25·04 per 1,000).

The death-rate by collectorates ranged from 47·51 per 1,000 in Ahmedabad to 20·93 in Ratnágiri. In 1891 the maximum and minimum ratios (42·11 and 14·99 per 1,000 respectively) occurred in Broach and Upper Sind Frontier.

According to age, the mortality amongst infants under one year and children above one year but under five was, as usual, very high in comparison with other periods of life, the death-rate amounting to 40·87 per cent. of the total deaths. The period of greatest immunity was as last year in the age period of above 10 and under 15, the rate being 9·46 living or 2·82 per cent. on the total deaths per 1,000. The percentage on total deaths amongst infants under one year was 19·95 against 22·18 in 1891. For those above one and under five the percentage on total deaths was 20·92 against 21·61 in 1891. Among old people of 60 and upwards the percentage on total deaths was 14·07 against 14·29 in 1891.

According to the census of 1891, the Mahomedan population numbered 3,501,910 persons amongst whom in 1892, 116,987 deaths were recorded against 76,401 in 1891, the death-rate being 33·41 per 1,000 of population against 21·82 in 1891. The Hindu population amounted to 14,897,629 persons, amongst whom 487,917 deaths or 32·75 per 1,000 of population were recorded. In 1891 the total deaths amongst this race were 431,153, equal to a death-rate of 28·94 per 1,000 of population. Amongst the Christian population, numbering 122,089 persons, 2,711 deaths were reported during the year against 2,433 in 1891, the death-rate being 22·21 against 19·93 per 1,000 in 1891. Under the heading "Other Castes" are included all those not belonging to either of the above sects who by the census of 1891 numbered 298,718 persons, amongst whom during 1892 there were 4,127 deaths against 3,145 in 1891, the death-rate being 13·82 per 1,000 against 10·53 in 1891. Among Mahomedans the maximum death-rate during the year (44·51 per 1,000) took place in the collectorate of Ahmedabad, and the minimum (17·81 per 1,000) in Khándesh. In 1891 the maximum death-rate was 38·68 per 1,000 in Násik, and the minimum 14·34 per 1,000 in the Upper Sind Frontier. Among Hindus the maximum death-rate (47·91 per 1,000) was in the collectorate of Ahmedabad, and the minimum (20·82 per 1,000) in Ratnágiri. In 1891 these rates were in Broach (46·83 per 1,000) and Hyderabad (19·10 per 1,000) respectively. The maximum death-rate during the year amongst Christians was 36·14, and was reported from the collectorate of Shikárpur, and the minimum (3·11) from Khándesh. In the collectorates of Broach, Panch, Maháls, Thar and Párkar, and Upper Sind Frontier no deaths amongst Christians were reported in 1892.

The subjoined table shows the deaths in 1892 arranged according to the specified causes laid down by the Government of India, and contrasted with the results for 1891 and the mean of the preceding 10 years. The causes of deaths will be briefly noticed in the next section :—

Causes of Death.	Mean for 10 Years, 1882–1891.		1891.		1892.	
	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.	Number.	Ratio per 1,000 of Population.
Cholera	21,286	1·27	17,850	0·95	42,900	2·28
Small-pox	5,183	0·31	1,491	0·08	2,770	0·15
Fevers	305,672	18·32	368,913	19·60	438,038	23·27
Dysentery and diarrhœa	39,133	2·34	37,728	2 00	35,406	1·88
Injuries	5,773	0·35	5,887	0·31	5,432	0·29
Other causes	67,493	4·04	81,263	4·32	87,196	4·63
All causes	444,540	26·63	513,132	27·26	611,742	32·50

The recorded death-rates among the urban and rural population of the Presidency were respectively 36·13 and 32·00 per 1,000 of population against 29·45 and 26·96 in 1891.

Chief Diseases.

Cholera.

During 1892, cholera caused 42,900 deaths throughout the Presidency, or 25,050 more than in the preceding year. The epidemic, as will be seen from the subjoined table, was most prevalent in the Dhárwár, Hyderabad, Karáchi, Belgaum, and Shikárpur collectorates, where 8,314 or 7·91, 5,762 or 6·27, 5,600 or 9·98, 5,259 or 5·20, and 3,297 or 3·60 deaths per 1,000 of population respectively took place; whilst the minimum mortality occurred in Broach and Ratnágiri collectorates, in which there were 16 and 94 deaths respectively registered.

In December 1891, cholera deaths were reported from six collectorates, including Dhárwár and Kánara. In these two collectorates only the disease continued in January of the present year, and 665 deaths were reported. There was also one death in the City of Bombay. From the same places 1,008 deaths were reported in the month of February. In March 1,672 deaths were returned from three collectorates, namely, Bombay City, Belgaum and Dhárwár. In April the disease increased, and caused 3,078 deaths in 10 collectorates. In May the disease had spread to 15 out of the 24 collectorates in the Presidency, and 6,050 deaths were reported from it. In June it assumed a still greater intensity, and no less than 8,089 deaths were reported from all the collectorates except Broach, Kaira, and Ahmedabad. During July the disease

assumed an epidemic form, as the mortality rose to 14,694, the maximum for the year, and it was present more or less in 23 zillas. In August there was a great decrease, 5,238 deaths having been reported. In September and October it rapidly subsided, as there were 1,562 deaths in the former, and 436 in the latter month. In November, there were 215 deaths from this disease in 15 collectorates, whilst in December 191 deaths, the monthly minimum for the year from the same cause took place in 12 collectorates.

In the Karachi collectorate the death-rate attained the high ratio of 9·98 per 1,000 of population. In the Dhárwár, Hyderabad, and Belgaum collectorates there were also high death-rates, namely, 7·92, 6·27, and 5·20 per 1,000, whilst in Upper Sind Frontier, although it was not so intense, it still reached the high ratio of 4·10 per 1,000. The epidemic in the remaining collectorates, although widely distributed, did not exhibit high ratios.

The affected area included 3,079 out of 25,143 villages in the Presidency. The highest percentage took place in Kárachi, where, out of its 791 villages, 424 or 53·60 per cent. were affected. In Belgaum, Dhárwár, Hyderabad, Shikárpur, and Upper Sind Frontier, the percentages were 28·64, 38·34, 30·14, 25·48, and 26·19 respectively, and in the remaining collectorates the percentages were below 20 per cent.

Small-pox.

During 1892 there were 2,770 deaths from small-pox (1,418 males and 1,352 females), against 1,491 in 1891 and a decennial mean of 5,183.

The Western Registration District attained a small-pox death-rate of 0·31 per 1,000, against 0·15 in 1891, and a decennial mean of 0·43. In the Southern Registration District the ratio was 0·23 against 0·11 in the previous year and 0·49 the decennial mean. In the Central Registration District it was 0·10 against 0·05 in the previous year, and a decennial mean of 0·24. In the Gujarát and Sind Registration Districts, the ratios per 1,000 of population were respectively 0·02 and 0·02 against 0·04 and 0·02 in the previous year, and a decennial mean of 0·13 and 0·25. In collectorates the highest death ratio, 0·67, took place in the town and island of Bombay, and 0·46 in the Dhárwár collectorate, and the lowest 0·00 took place in Kaira and Shikárpur, and 0·01 in Surat and Ahmedabad collectorates. The district of Upper Sind Frontier was free. The Presidency rate was 0·15 against 0·08 in the previous year, and 0·31 the decennial mean.

Of the total small-pox deaths, 24·99 per cent. occurred among infants under one year of age, whilst 46·71 per cent. took place among children over 1 and under 12, the remaining 28·30 per cent. being among persons over 12 years of age.

Fever.

During 1892, 226,011 males and 212,027 females, or a total of 438,038 persons, were reported to have died from fever, against 368,913 in 1891, showing an increase of 69,125 deaths for the year, the mean for the previous ten years being 305,672.

In the Gujárat Registration District fever caused a high mortality, 34·89 per 1,000 during the year against 27·62 in 1891, and the decennial mean 24·39. In the Sind Registration District the death ratio was 27·63, against 17·07 in the previous year, and 15·78 the decennial mean. In the Western Registration District the ratio for the year was 20·29 against 20·97 in the previous year, and 18·45 the ten years' mean. In the Central and Southern Registration Districts the respective ratios for the year were 19·62 and 18·24, against 18·11 and 14·65 in the previous year, and 17·54 and 15·31 the ten years' means. Excepting the three collectorates of Khándesh, Násik, and Broach, in every collectorate the fever death-rate was higher than that of the previous year, and in 11 collectorates it was above the average rate of 23·27. The collectorate of Ahmedabad heads the list with the very high ratio of 41·41, against 31·44 in 1891, and 25·53 in the previous ten years. In the following collectorates high death ratios occurred:—Broach 35·06, Shikárpur 34·49, Kaira 33·76, Surat 31·22, Upper Sind Frontier 27·49, Karáchi 26·70, Panch Maháls 26·25, Násik 24·44, Khándesh 24·11, and Thar and Párkar, 23·99, the Presidency rate being 23·27 against 19·60 in the previous year and 18·32 the decennial mean.

Excepting in the months of April, May, June, and December, the deaths from fever were both above the mean and of the corresponding months of 1891. In April, May, June, and December, these deaths were below the previous year, but they were above the mean. The maximum mortality from fever took place in January, when 57,782 deaths were reported, and the minimum in June, when 25,480 deaths were recorded from this cause.

Based on the ratio of deaths per 1,000 of population, Sind shows the largest increase in the mortality from fever, being an increase of 11·85 per 1,000 over the mean for ten years. Now, in Sind, the fever deaths in 1891 commenced from November, and show

a large increase, which culminated in January of the present year; the deaths then sank in February to less than half the number of the preceding month, and continued to lessen in number till May, after which the number rose gradually each succeeding month till there was a large rise in October, still further increased in November with a fall again in December. The rainfall greatly exceeded the fall of the previous year, especially in Karáchi, Hyderabad, and Thar and Párkar, but in 1890 there was more rainfall but more distributed. The temperature was higher. Generally food-grain was dearer than last year, and there has been a distinct rise in the price since 1887, as shown in the comparative statement. The direction of the wind was from north-north-east or north-west in January, February, November, and December, and from the south, chiefly south-west, from March to October.

Dysentery and diarrhœa.

During 1892, dysentery and diarrhœa caused the deaths of 19,349 males and 16,060 females, or a total of 35,406 persons against 37,728 in 1891, and a decennial mean of 39,133.

The Southern Registration District heads the list with a ratio of 4·37 per 1,000 against 4·55 in 1891, and 4·67 the decennial mean. The Western Registration District comes next with a ratio of 2·56, the Central Registration District 1·58, the Gujarát Registration District 0·31, and the Sind Registration District 0·17. In the Presidency the rate was 1·88 against 2·00 in the previous year and a decennial of 2·34. Excepting in the collectorates of Khándesh, Násik, Ahmednagar, Ratnágiri, Bijápur, Broach, Panch Maháls, Thar and Párkar, and Upper Sind Frontier, the death-rate for the year was slightly higher in all the collectorates. The highest ratios recorded were in Belgaum 5·95, Dhárwar 4·97, Násik 3·58, Bijápur, 3·28, and Khándesh 3·25, and the lowest 0·08 in Panch Maháls, and 0·06 in Hyderabad and Thar and Párkar.

During the year in March, July, November, and December, the deaths from dysentery and diarrhœa exceeded those recorded in 1891, but in the other months they were less. The maximum mortality occurred in August and the minimum in February.

Injuries.

During 1892, 3,092 males and 2,340 females, or a total of 5,432 persons, met with violent deaths. The mortality from these causes is less by 455 than that reported in 1891, when 5,887 deaths were recorded. Of the 5,432 deaths, 2,380 happened from drowning, 1,073 resulted from snake bites, 438 from wounds, 184 from hanging, 124 from poisoning, 63 from attacks by wild beasts, and 1,170 from causes not specified.

Other causes.

The recorded deaths from causes other than those specified number 87,196, of which 43,996 occurred among males and 43,200 among females. The total for 1891 was 81,263. There is an increase of 5,933 under this head.

Sanitary Works—Military and Civil.

All available information under these sections has been thrown into a tabular form, and will be found in Appendices Nos. V. and VI., as directed in paragraph 5 of Government Resolution No. 3393, General Department, dated 28th September 1888.

Personal Proceedings and General Remarks.

I took over charge of the office of the Sanitary Commissioner on the 4th June 1892, from Surgeon-Lieut.-Colonel C. W. MacRury, who proceeded on eighteen months' furlough.

The Sanitary Board for the Bombay Presidency was formed on 23rd January 1892, and its proceedings are included in this report.

Before leaving on furlough, Dr. MacRury inspected from the beginning of the year the municipalities of Nadiád, Virámgam, Ahmedabad, Broach, Bulsár, Sholápur, Bijápur, Bágalkot, Gadag Bettigiri, Hubli, Dhárwár, Belgaum, and Sátára, but as remarks on these places have been included in last year's report they are not entered in this.

Most of my touring was done in company of the Sanitary Engineer. In most cases sanitary defects and their remedies were discussed with the members of the various municipalities, and a letter on these subjects invariably followed, addressed to the President through the Collector of the district.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF THE PORT OF BOMBAY.

Shipping and Health of the Port.—The following table gives a summary of the shipping and health of the Port of Bombay and of the work in connexion therewith for the year ending 31st December 1892 :—

Vessels including Native Craft.	Number.	Number of Passengers as far as is known.	Number of Vessels inspected.	Number of Persons, including Crew, inspected.	Number of Vessels disinfected.	Number of Persons vaccinated.	Diseases and Number of Cases of each.				Number of Boats with foul or rotten Cargo.
							Cholera.	Small-pox.	Measles.	Chicken-pox.	
Entered	48,192	420,372	32	23,431	16	758	4	10	3	2	2
Left	36,514	363,512	664	75,659	2	—	—	2	—	—	—
In harbour, including population	1,297	22,142	23	—	23	86	13	7	6	—	—
	—	—	—	—	1	—	—	—	—	—	1
Total	86,003	806,026	719	99,090	42	844	17	19	9	2	3
1891	84,016	800,521	769	103,009	30	1,000	48	12	11	3	16

In the above table the number of crew on board ships entering the harbour during the year is not shown, as no record is kept.

Infected Arrivals.—The following table shows the number of ships which had infectious disease on board on or before entering the harbour :—

Class of Vessel.	Number of Ships.	Total Number of Crew and Passengers.	Diseases and Number of Cases of each.				Suspicious Cargo.
			Cholera.	Small-pox.	Measles.	Chicken-pox.	
1. Troop ships	2	3,227	—	—	3	—	—
2. Pilgrim ships	3	1,580	—	3	—	—	—
3. Other vessels	10	1,665	4	7	—	2	—
4. Vessels with suspicious cargo (hides from East African ports or rotten fish)	2	25	—	—	—	—	2
Total	17	6,497	4	10	3	2	2
1891	12	4,178	5	4	11	3	6

The above table does not include the cases of infectious disease which occurred on vessels in the harbour or among the harbour population.

The cases of measles on board of Her Majesty's Indian troopships were landed and isolated in the Military Cantonment at Colába. The pilgrim and other ships with small-pox were only detained until all on board had been vaccinated and the vessels thoroughly disinfected. This detention lasts from two to six hours, but it all depends on the number of crew and passengers who are to be vaccinated.

No pilgrim ships returned from Jeddah with cholera during the year.

In addition to the ships shown in the above table a large number of others, including native craft and coasting steamers, were inspected during the year, but as no infectious disease dangerous to life was found they are not included in the return.

The following table shows the total number of vessels bound for all quarantine ports which were inspected and granted Form B. Bill of Health during the year 1892 :—

No.	Class.	Number of Vessels.	Tonnage (Net).	Total Number of Crew, Passengers, Pilgrims, and Troops.
1	Square-rigged vessels and steamers - -	449	828,741·23	41,331
2	Native craft - - - - -	181	22,374·28	4,620
3	Pilgrim ships - - - - -	19	22,789·37	14,198
4	Her Majesty's Indian Troop, marine ships, and men-of-war.	15	67,764	15,510
	Total - - -	664	941,668·88	75,659
	1891 - - -	722	1,074,459·82	82,048

In addition to the above, Form C. Bill of Health was issued to 518 vessels. It is usually taken by vessels bound for Indian, China, and East African ports, where quarantine restrictions are mild or are only put in force against arrivals from places where epidemics are actually prevailing. The total number of bills of health issued, including Form B., was, therefore, 1,162 against 1,264 in the year 1891 and 1,130 in 1890.

The remaining vessels, 35,252 in number, took no bill of health, as they were generally native coasting craft and Shepherd's ferry steamers.

In addition to the 181 outward bound native craft inspected, a large number of buggalows with passengers left for Indian ports, but as almost all of them sail without a bill of health no record is kept.

Disinfection of Ships and General Health of the Shipping.—There were in all 42 vessels disinfected during the year—40 on account of infectious disease and the remaining two for damaged or rotten cargo. The disinfection was carried out in a most satisfactory manner by the Water Police according to the instructions given by the Health Officer.

The general health of the harbour population was reported as good during the year. The St. George's Hospital admitted during that time 596 Europeans connected with the shipping and the harbour, of whom 30 died; whilst the Goculdáss Tejpál admitted 205 natives, of whom 12 died, and the Jamsetji Jijibhoy, 98 natives, of whom seven died. The principal causes of admissions were due to accidents, fevers, venereal, chest, and bowel complaints. There were no cases of bilge poisoning reported during the year.

Quarantine.—During the year 1892 Suez did not impose quarantine against Bombay.

The British India Steam Navigation Company complains of the imposition of vexatious quarantine at Persian Gulf ports. It appears that all arrivals at Bussorah are subject to 24 hours' observation if they have a medical officer on board and to six days' quarantine if they arrive without one, althongh the bill of health may be absolutely clean and Bombay free from cholera.

The German Line also complains of one of its steamers being quarantined at a Spanish port for 13 days on account of the mention of two sporadic cases of cholera in the necrological certificate furnished to all vessels proceeding through the Canal.

Red Sea Pilgrim Traffic.—Nineteen pilgrim vessels with 12,787 souls left Bombay for Jeddah during the year, and 19 ships arrived from Jeddah on board of which 11,994 souls embarked. Of these, 2,403 were landed at Hodeida, Aden, Muculla, and Karáchi, and 9,490 at Bombay. On the outward voyages there were 27 deaths, or at the rate of 55 per 1,000 per annum, while on the return voyages there were 101 deaths, or at the rate of 219 per 1,000 per annum on the basis of a 14 days' voyage. The mortality on shore is not included as only deaths on board ship are noticed.

The defective sanitary condition of pilgrim ships is due to overcrowding of passengers and baggage, and the absence of any rule insisting on a specified area of ventilation per passenger, and also to the fact that the officer who surveys the ship under the Native Passenger Ships Act is considered by the Code to be an expert in ventilation, no matter what his qualifications may be.

During the year 1891 pressure was brought to bear on shipowners to remedy the defective ventilation, and after two steamers were refused bills of health until the improvements suggested were carried out, no further difficulty was experienced in obtaining a better state of things on board the other vessels engaged in the traffic.

The year 1891 was a favourable one when compared with previous years, inasmuch as the mortality on board was less by over 40 per cent. on both the outward and inward voyages. In the year 1892 the mortality was also comparatively low when compared with that of previous years.

The pilgrim traffic is a most important one on this side of India, representing as it does the departure from Bombay of 11 to 15 thousand pilgrims annually on a long voyage. I give a table showing the number of pilgrims who left and arrived at Bombay during the last eight years, from which it will be seen that a large number never returned; and whether this is due to deaths while on the Haj, or whether they returned to their homes by other routes, I am unable to say. It is probably due to both causes; but I believe the greater number of the missing are accounted for by epidemic disease in Mecca, starvation, and, it is rumoured, ill-treatment by Bedouins while on the land journey from Jeddah to Mecca and Medina. Her Majesty's Consul at Jeddah complains that one-third of the Indian pilgrims are paupers. The practice that shipowners have of giving free passages to paupers to fill up the vessel to her full complement on her departure from Bombay cannot be too strongly condemned. They go on board at the last moment without food or clothing and help to swell the mortality :—

In the Year.	Number of Pilgrims who			In the Year.	Number of Pilgrims who		
	Left Bombay.	Returned to Bombay.	Difference (Missing).		Left Bombay.	Returned to Bombay.	Difference (Missing).
1885 - -	8,436	5,045	3,391	1890 - -	11,665	8,662	3,003
1886 - -	8,606	6,150	2,456	1891 - -	14,068	8,677	5,391
1887 - -	9,466	5,726	3,740	1892 - -	12,787	9,490	3,297
1888 - -	13,970	6,505	7,465				
1889 - -	12,495	10,101	2,394	Total -	91,493	60,356	31,137

The accuracy of these figures has been questioned, and I admit the above return is only approximate; but if the exact numbers of Indian and Eastern pilgrims who landed at and returned from Jeddah could be obtained for a series of years, they would, I believe, prove that the above figures are in the main correct, showing as they do that one-third of the pilgrims who leave Bombay never return, and in support of this statement Her Majesty's Consul at Jeddah has favoured me with a return for the Haj seasons of 1891 and 1892, which shows that for the 52,518 Eastern pilgrims who arrived at Jeddah, only 37,048 left for the East. The departures fall short of the arrivals by 15,470, or about one-third, and of these no satisfactory information can be given.

Table supplied by Her Majesty's Consul at Jeddah showing the Number of—

Nationality.	Pilgrims who arrived at Jeddah from the East during the Haj Seasons of 1891 and 1892.				Pilgrims who left Jeddah for the East after the Haj Seasons of 1891 and 1892.		
	Pilgrims landed at Jeddah *viâ* Cameran.	Pilgrims landed at Jeddah *viâ* Suez.	Pilgrims landed at Yembo.	Total.	Pilgrims who departed *viâ* Strait of Babelmandeb.	Pilgrims who departed *viâ* Suez.	Total.
1891.							
Indians - -	11,015	20	12	11,407	7,770	—	7,770
Javanese - -	10,636	181	—	10,817	7,557	—	7,557
Persians -	1,072	645	237	1,954	471	200	671
Bokharies - -	1,086	557	410	2,053	822	585	1,407
Total for 1891 -	23,809	1,403	659	25,871	16,620	785	17,405
1892.							
Indians - -	10,916	43	—	10,959	8,748	—	8,748
Javanese - -	11,500	8	—	11,508	7,204	—	7,204
Persians - -	431	590	—	1,021	603	342	945
Bokharies - -	2,755	404	—	3,159	2,373	373	2,746
Total for 1892 -	25,602	1,045	—	26,647	18,928	715	19,643
Grand Total -	49,411	2,448	659	52,518	35,548	1,500	37,048

Of the 26,647 arrivals at Jeddah, shown in the above table for 1892, 12,787 left Bombay in pilgrim ships, that is ships that carried 60 or more pilgrims. The remainder came from Calcutta, Singapore, Batavia, Zanzibar, Bussorah, &c.

I also append a table showing the mortality among pilgrims on board ships on their return voyages from Jeddah since 1885 :—

Year.	Ratio of Deaths per 1,000 per annum.	Remarks.	Year.	Ratio of Deaths per 1,000 per annum.	Remarks.
1885 - -	301	Deaths per thousand per annum on the basis of a 14 days' voyage.	1889 - -	238	Deaths per thousand per annum on the basis of a 14 days' voyage.
1886 - -	379		1890 - -	287	
1887 - -	291		1891 - -	176	
1888 - -	275		1892 - -	219	

The heavy death-rate on the return voyage is due to privation before they embark at Jeddah, starvation, overcrowding, and sickness on board insanitary ships, want of supervision, and to the fact that a number of the pilgrims are old, sick, blind, lame, and infants of a few days old. Making, however, all due allowance for the latter causes, it must be admitted that the death-rate is enormous and far exceeds that of the old days before the various Emigration Acts were passed. As the defects in the traffic as well as the suggestions made for its improvement have been noticed in detail year after year and in special reports for the information of Government, it is not necessary to recapitulate them here. The pilgrim traffic as regards space, ventilation, food, baggage, and Government supervision should be placed under the same rules as apply to people and ships coming under the Indian Emigration Act.

The system of counting two children under 12 years as an adult pilgrim for the purpose of allotting the space should be discontinued, and each soul on board, whether under or over 12, should receive the space sanctioned for an adult. I have seen males with moustaches and females the mothers of children counted as children, and, as such, receive only half the accommodation assigned to adults, viz., $4\frac{1}{2}$ superficial and 27 cubic feet.

If the Turkish authorities insist on all Indian pilgrims undergoing ten days' quarantine at Cameran, its sanitary condition, which is reported to be bad, should be improved, and water condensed as at Aden supplied to the pilgrims. It is not uncommon on the departure of a pilgrim ship from Bombay to see a large portion of the upper deck, which is supposed to be reserved as an airing place for passengers, occupied by barrels of drinking water belonging to the richer Mussulmáns who are making the Haj. This demand is not too much, as pilgrims have to pay Rs. 10 per head for the accommodation and water provided at Cameran.

Although the pilgrim ships leaving Bombay require improvement, I may mention that the accommodation provided in them is immensely superior to what I have seen on board Persian Gulf and Zanzibar steamers touching at Aden, and this point should be remembered whenever the Turkish authorities complain to the Indian Government about the overcrowding of pilgrim ships. The Turkish authorities apparently make no distinction between Indian ships and those that arrive from such ports as Bussorah, Zanzibar, and the Straits Settlements.

It is seldom that the annual pilgrimage, which draws about 150,000 pilgrims from all parts of the Mahomedan world to Mecca, is not characterised by an outbreak of cholera and small-pox. It is computed on fairly trustworthy data that 20 per cent. die in ordinary years and about 35 per cent. in years marked by virulent outbreaks of epidemic disease. People who return from Jeddah and Mecca describe the state of the sacred cities as filthy in the extreme, more especially after the sacrifice of the thousands of animals which takes place on a certain date.

The point I wish to make clear is that whenever cholera threatens to invade Egypt or Europe, India gets the credit of originating it, and the Egyptian Board of Health, which is composed of delegates from nearly all European nations, endeavour by means of quarantine, rigorously and often vexatiously enforced, to prevent the scourge from spreading towards Europe. I believe that whenever cholera reached Europe, it had its starting point in Arabia and found its way to Europe overland *viâ* Damascus and other Syrian cities. As the question is one of international importance it would be well if the Egyptian Board of Health directed their attention to the sanitary condition of the Haj cities, more especially Cameran, El Tor, Jeddah, Mecca, and Medina. It is stated, but with what truth I do not know, that the road from Jeddah to Mecca and Medina is paved with bones.

Bombay is now, as regards sanitary conditions, the port on which the eyes of Egypt and European Continental nations are turned, and, as a consequence, the medical inspection of all passengers, pilgrims, and ships for European, Red Sea, and quarantine ports is most strict. No ship bound for any of the above ports is granted a bill of health until the crew and every person on board are seen by the Health Officer, who is to satisfy himself that they are free from certain infectious diseases at the time of sailing.

The Jáffer Sulemán Musàffarkhána, which is a building erected on the hollow square principle in Mody Bay, has been much used by the pilgrims, some 6,000 having obtained shelter during the year 1892. The sanitary condition of this very useful building would be improved by opening the large doors, which are situated in each side of the square, thereby allowing a free perflation of air through the pile of buildings situated all round.

Sanitary State of the Harbour and Foreshore.—Although the sanitary condition of the foreshore has been improved very considerably during recent years, there are a few spots which are a blot on this otherwise beautiful harbour; but before noticing them I wish to draw attention to the Ramosis placed on the foreshore by the Port Trust. These men are a failure, as most of them are decrepit and will not or cannot prevent the people from fouling the foreshore. If the present useless watchmen are replaced by men of the Pathán type (who should be well paid and held responsible for the cleanliness of the place), the foreshore would in a short time cease to be a vast latrine.

As the insanitary condition of all the basins, bandars and foreshore and the suggestions made for their improvement have been noticed in the last and previous annual reports, it is not considered necessary to refer to them again in detail, more especially as the Port Trustees are at last taking steps to prevent the discharge of nightsoil, sullage water, and other refuse into the harbour. This is at present done in the most unblushing manner.

The most foul places on the south-west are Victoria Boat Basin and all the foreshore between it and the Gun Carriage Basin. This part of the foreshore and harbour are used for the disposal of all the nightsoil coming from the population of Lower and Middle Colába. The most foul portion of the foreshore here is the private property of the Colába Land and Mill Company. The thousands of people who find shelter on this property are compelled to use the harbour wall and ground in its immediate vicinity for the purposes of nature owing to the want of latrine accommodation. If a visit is paid to this place in the early morning, the most disgusting and demoralising sights will be witnessed. This has been brought to notice year after year.

Some of the bandars to the north of the Prince's Dock are bad owing to the accumulation of fish refuse, heaps of bones to which decomposing flesh is attached, nightsoil, and other abominations. The basins including the Kássara Basin and all the foreshore as far as Sion Bandar are in a very foul condition. At low water they are all exposed to the sun, where they become a festering and putrid mass of rotting matter. At ordinary high tide the sea does not cover the whole of this foreshore, and the drift of old timber, floating-logs, and deleterious matter of all kinds form dams dividing the surface into pools, where an oozy mass of poisonous liquid stagnates.

I also wish to draw particular attention to Back Bay. The complaints this year have been numerous. The bay is fouled by two drains, the worst being situated immediately to the north of the new block of buildings erected by government as family quarters for warrant officers. This drain comes from a chawl close by and discharges on to the sand a most foul-smelling black liquid. Government invited the attention of the municipality to this drain last year, but nothing has been done. A few thousand rupees would buy up the chawl, and if it were demolished, the nuisance would cease. The other place to which I refer is the sewer discharging into Back Bay close to the Marine Lines Station. Another smell which has been complained of by residents in the Marine Lines, and which at times is so bad as to compel military men to send their families elsewhere during its prevalence, comes from Back Bay. It is most noticeable at about full and new moon. At these times the tides are very low, and long stretches of the fouled, stoney bottom of the bay containing dead shellfish are left exposed for hours to a burning sun.

The prevailing wind for eight or nine months of the year blows from Back Bay bringing the stench with it. This can be readily verified by a temporary residence in the lines or by walking on the foreshore or driving along the Queen's Road at low water.

The sanitary condition of the Prince's and Victoria Docks is very good, and the latrine arrangements leave nothing to be desired.

ABSTRACT OF REPORT OF THE CALCUTTA MUNICIPALITY FOR 1892-93.

(Mr. J. G. Ritchie, Officiating Chairman.)

Progress of Sanitation in Calcutta* since 1859.

At the International Congress of Hygiene and Demography held in London in August 1891, a paper was read by the Hon. H. J. S. Cotton, C.S.I.. a former chairman of the Corporation, admirably summarising the progress of sanitation in Calcutta. The Commissioners think that they cannot do better than open this report with a reproduction of that summary, the figures, with Mr. Cotton's permission, being brought up to the date of 1st April 1893, except when otherwise mentioned; the figures include the additions rendered necessary by the amalgamation of the suburbs with the town.

Mr. Cotton's Paper.

The underground drainage system of Calcutta was commenced in 1859. The total expenditure incurred on the work up to the 31st March 1893, is Rs. 1,11,27,700.

The number of premises connected with the sewers is 27,560. There are 43 miles of main or brick-sewers, and 144 miles of pipe-sewers. The enormous improvements effected by the obliteration of the old open drains—an elongated cess-pool, as they have been called—and the substitution of underground drainage in their place, can only be appreciated by those who remember Calcutta in former days; but it may still be partially realised by a visit to the suburbs of the town, where open drains still exist. A survey for the systematic drainage of the suburbs is now in progress.

The total capital sunk in the Calcutta Waterworks is, in round numbers, Rs. 1,63,00,000, of which nearly half has been spent on extensions of the original scheme. This outlay has been amply repaid not only by the improved health of the inhabitants, but also by the increase of wealth and material prosperity which the reputation for good drinking water has attracted to the city. It was officially stated on 1st April 1893 that there were 1,750 standposts on the filtered, and 3,044 ground hydrants on the filtered and unfiltered systems. The number of house-ferrule connections was 20,159. The daily supply had then reached an average of 30·84 gallons of filtered water, and 9·47 gallons of unfiltered water per head of population. The filtered water is of the highest possible quality of purity.

The roadway of the town proper has been augmented during the past 15 years by about 17 per cent., and the area of roads watered by 40 per cent. The lighting of the town has increased from 3,418 lamps to 7,291. The quantity of refuse removed from the town has been nearly quadrupled, having increased from about 80,000 to more than 316,247 tons. About 277 impure and insanitary tanks have been filled up, and tanks, other than those in private enclosures, are now very rare in any part of the town, except in the extreme north. In the place of tanks, the town has been studded with 88 bathing platforms for the use of the poorer inhabitants; six public squares have been constructed and laid out at considerable expense to the great advantage of the people living in the neighbourhood. During the past 10 years Rs. 8,68,961 have been expended on bustee improvement.

It was observed by one of the late health officers of Calcutta, in a published address, that "Calcutta has, to sight and sense, within living memory undergone a revolution," and it may be added that during the past 14 years the changes effected had been more rapid and decisive than in the 20 years which preceded them. Dividing these years into three quadrennial periods, it is found that, during the first of these periods, the total number of deaths in the town proper was 62,226, during the second 49,863, and during the third 38,089 (1890 to 1892). But the improvement is most marked in its

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* Throughout this Administration Report, by *Calcutta* is meant the whole area of Municipality under the jurisdiction of the Corporation. The *Town* or the *Town proper* refers to the Municipal Area as bounded before amalgamation, with the Suburbs, and *the Suburbs* or the *Added Area* means the area added at the time of the amalgamation.

effect upon the wealth of the town. It is stated to be, on the whole, a very moderate estimate that, while the population has practically remained stationary, the value of land has more than doubled since 1878, and that the increased value to the owners is about nine crores of rupees. It would be difficult to produce a more decisive tribute to the wisdom of sanitation.

The present recorded death-rate of the town proper averages 27 per 1,000 (1890 to 1892). These statistics, however, place the public health of Calcutta in a fictitiously favourable light. The population is largely an immigrant one, and more than half consists of individuals who are in the full vigour of manhood and womanhood, the majority of whom, when they become seriously ill, leave Calcutta for their homes. On the other hand, it is usual among persons of the respectable and middle classes when they are old or ill, to come into Calcutta on account of its superior sanitary attractions and for medical attendance. But, while the death-rate cannot be accepted as an absolute test of the health of the city, the statistics do enable a comparison to be made of the mortality in different years, and it is highly interesting to notice the great diminution in the number of deaths from such principal diseases as cholera since the drainage works have been constructed, a pure water supply given, and other sanitary improvements set on foot.

The mortality from cholera in the town proper has been carefully registered for the past 50 years, and the average annual number of deaths from this cause during each of the five decades is as follows :—

—	1840 to 1892.	Average Annual No. of Deaths.
First decade	1840 to 1849	4,818
Second decade	1850 to 1859	4,261
Third decade	1860 to 1869	4,747
Fourth decade	1870 to 1879	1,327
Fifth decade	1880 to 1889	1,640
	1890 to 1892	1,257

There is, no doubt, a marked periodicity in the mortality from cholera, which seems to point to some biological law in the life-history of cholera contagion. The synchronous rise and fall of cholera in Calcutta and in the neighbouring districts of Bengal is of almost invariable occurrence. Calcutta is affected by causes not peculiar to itself, but common to all the neighbouring localities, and although the incidence of mortality is now low in Calcutta, in consequence of the extensive sanitary works which have been undertaken, a more or less corresponding ratio continues to exist between Calcutta and the adjoining populations. It is owing to this periodic intensity of an epidemic wave of cholera, more than to any other cause, that the average number of deaths during the 10 years from 1880 to 1889 exceeds the average of the previous decade. During 1882, 1883, and 1884, there was a violent outburst of cholera, not in Calcutta only, but throughout the neighbouring districts. It is also true that, during the 30 years which preceded the introduction of a pure water-supply, *i.e.*, before 1870, there was a similar periodicity in the cholera death-rate; but during that period the lowest annual number of deaths was 2,268 (in 1867), and 2,502 (in 1848), and the highest was 6,826 (in 1866), 6,553 (in 1860), and 6,427 in (1846), whereas after the introduction of the water-supply the lowest annual death-total has been 796 (in 1871) and 805 (in 1880), and the highest 2,272 (in 1884). Generally speaking, therefore, it may be said that, during the last 20 years, when a pure water-supply has been available, the cholera mortality is only one-third of what it was in former times. It may be admitted, as an eminent authority, Dr. J. M. Cuningham, has pointed out, that the fall in cholera mortality in 1870 was partly due to other causes, and that it was pronounced before one drop of water reached the city; but, be this as it may, the comparative average immunity which has persistently prevailed since 1870, can only be explained by attributing it to the improved water-supply which dates from that year. The change which has taken place in Calcutta in regard to cholera is indeed extraordinary, and sanitarians may well appeal to the evidence of these figures as demonstrating with mathematical certainty that sanitary reform, and, above all, the supply of pure water, is the only effectual method for controlling this terrible disease.

When all has been said, it must be admitted that the conditions of life in the metropolis of British India are still highly insalubrious. The cholera map of Calcutta is still simply a map in which the whole of the native town appears one mass of red

dots indicating cholera deaths, and the inspection of this map, with its record of more than 1,000, cannot fail to awaken a sense of how much remains to be done to improve sanitation. The Health Officer of the Corporation has lately called attention in the most prominent manner to the ventilation of the city by proper streets and squares, and to the enforcement of proper building regulations as the most important sanitary measures which it remains to undertake. Pure air is as much a necessity for the public health as pure water, and the overcrowding of buildings not only impedes the circulation of air and disseminates disease along the poisonous alleys which divide house from house, and harbours the germs of all diseases, but it prevents the possibility of laying down efficient drainage, and hinders and adds to the cost of scavenging. The ground of Calcutta is literally covered with houses without open spaces between them, and narrow streets, winding lanes, and zig-zag passages afford complete obstacles to thorough ventilation. The statistics which the municipal reports furnish indicate the radical structural defects of Calcutta as a residential city. The roadway of the town proper extends over 164 miles, of which only 31 miles are roads of 32 feet in width and upwards; 114 miles vary in width from 9 to 31 feet, 18½ miles are less than 9 feet in width, and 35 miles are sewered ditches, which, from the nature of the case, are often not more than 3 feet in width. The fine new street known as the Harrison Road, which the Municipal Commissioners have, at great expense and with much public spirit, lately determined to cut through that overcrowded and overbuilt portion of the city, is a very important and valuable sanitary improvement. This road is now complete. But it will exercise only a small influence in doing away with the evils of congested and unregulated buildings, unless streets from north to south and from south to north be constructed to meet it. The great structural defect which prevails, especially in Burra-Bazar, but also throughout the whole of the heart of Calcutta, where the residents of the city dwell, is, and always has been, due to the toleration of too many houses and too many people on too limited a space, instead of forcing them to spread out on a wider area. The plan of construction of the city being radically defective, the supply of every other sanitary improvement is only palliative, while that constitutional defect remains. It will never be possible to wipe away the reproach under which Calcutta labours as the home of cholera until the present germ laden air is as purified from contagion as is the filtered water now drunk by the people.

In conclusion, it must be added, in justice to the Corporation of Calcutta, that the Municipal Commissioners are fully alive to the urgent necessity of energetically pursuing the course of sanitary improvement. Immense as are the difficulties of introducing sanitation into an Oriental city according to the Western ideas of the present day, the problem in Calcutta is now in process of solution. Enormous sums have already been spent and will continue to be spent; but it must be remembered that progress can only be gradual, and that the local authorities are hampered not only by financial considerations, but by the conservative habits of the people, which in the eyes of a sanitary reformer appear too often to be purely obstructive. It must be remembered also, that the secret of overcoming this obstruction is to be found, not in attempting to coerce popular feeling by persistent condemnation, but in conciliation and sympathy.

Summary of Original Works of Improvement in Progress during the Year 1892–93.

The full detail of these works will be found in the last three chapters of Part I., and in the reports of the Engineer and Health Officer. The following is a general summary of the more important works.

The Harrison Road has been completed, and the electric light upon it installed. The Lansdowne Road has been completed up to the sanctioned limit, and also the Puddopooker Tank Square, near which this road ends at present.

Good progress was made with the construction of the two new settling tanks at Pulta, with a grip drain and metalled road round them. Eighteen miles of pipes for the extension of the filtered water supply have been laid. A new pump for B. engine was installed at Pulta Pumping Station. At Tallah Pumping Station a new workshop has been constructed, and the old workshop has been converted into an economiser chamber.

A large flushing reservoir, holding 300,000 gallons for flushing the Circular Road sewer, was constructed near Bhowanipore Pumping Station. Twenty-nine special flushing chambers were also constructed; 1,214 yards of sewer have been constructed.

Progress was made with the preparation of detailed working plans, &c., for the surface drainage of wards 19, 20, 21, and 22.

Thirteen new railway waggons and 40 new conservancy and road-watering carts were constructed at the workshops.

1,400 feet of public road, and 1,746 feet of bustee road were constructed. 1·68 miles of kirb and channel stones were set in the public streets, and 1·03 miles were set in new bustee roads. One bathing platform was constructed, and three were extended. Rs. 53,221 were spent on bustee improvements, including road and sewer construction and bathing platforms. Rs. 34,574 were spent on town improvements, including short pieces of new road, widening roads and lanes, and rounding-off corners.

Rs. 23,194 were spent on tank-filling, including big tanks in Gas Street, Manicktola Street, and Ramkissen Dass' Lane.

Two Macfarlane's urinals were erected.

The following were the works of Suburban Improvement which have not been included in the above :—

Rs. 23,110 was spent on the construction of hackney carriage stands, and land acquisition for the same in the suburbs. Rs. 15,000 was contributed to the new cart-bridge over Tolly's Nullah. Rs. 3,788 was spent on the Matiobrooj Khal sluice. A large number of other improvements were carried out.

Good progress was made in the land acquisition for the new Chetla Road, estimated to cost Rs. 81,952.

The Goragatcha Incinerator was completed at a cost of Rs. 44,075. Rs. 7,699 was spent on a new night-soil cart depôt on the Budge-Budge Road, the result of which has been to remove a great nuisance. A disinfector for the Health Department was imported at a cost of Rs. 2,572.

Vital Statistics of Calcutta.—In considering the vital statistics for Calcutta, it is always necessary to bear in mind the special circumstances of population. The Census shows that the population is essentially a floating one, and that emigration and immigration are constantly going on. The number of males is nearly double the number of females. The birth-rate is therefore low, and the population of the infantile inhabitants of Calcutta (*i.e*, below five years) is small in comparison with other towns. The death-rate of Calcutta will, in consequence, compare favourably with that of other towns, where the population is more stationary, and it is only by examining the *age death-rate* that a true basis for comparison with other places is obtained.

On the other hand, a large proportion of the deaths occur among persons who have been brought into the town proper during their last illness. Out of 989 persons whose deaths were registered at Nimtollah Burning Ghat from 1st June to 7th August 1893, 201 or 20 per cent. were returned as residents of less than one year.

Birth registration shows continuous improvement. The number of births recorded was 12,688, being 18·6 per 1,000, which is the highest birth-rate recorded since the amalgamation. The improvement in the birth registration of the suburbs is noticeable, the following being the figures of the ratio per 1,000 for the four years since the amalgamation—16·1, 18·4, 19·6, and 21·2.

There were recorded 20,180 deaths in 1892, giving a ratio per 1,000 of 29·6. The following gives the death-rate for the past four years :—

Death-rate.

Year.	Town.	Suburbs.	Calcutta.	Year.	Town.	Suburbs.	Calcutta.
1889 - -	25	36·6	28·7	1891 - -	27·9	39·4	31·5
1890 - -	26·5	37·1	29·8	1892 - -	27·1	34·8	29·6

These figures indicate that there has been a distinct improvement in the health of suburban Calcutta during the year.

On pp. 123-4 of his report (p. 134 of abstract), the Health Officer has instituted an interesting comparison between the different wards in respect of birth-rate and death-rate. The birth-rate varies from 4·6 in Burrabazar and Waterloo Street wards, to 32 5 in Hastings. The death-rate varies from 13·3 in Waterloo Street to 44·1 in the fringe area of Burtollah, and 42·3 in fringe area of the Sukea's Street ward. This fringe area, lying between the Circular Road and the Canal, is low-lying,

overcrowded, and full of contaminated tanks. The ground level is too low to admit of drainage connections with the Circular Road main sewer or the storm-water sewer, and the whole area is very partially drained. The Health Officer has pointed out the need of filling up the worst tanks in this part as a means for checking cholera, and the Commissioners are sensible of the necessity.

It is noticeable that, in Watgunge and Alipore wards which have no underground drainage, the death-rate even now is lower than in most of the northern wards. The Health Officer attributes this result to the overcrowding in the northern wards, and the excessive strain that is thereby placed on the sewer system in these wards.

The rise of the death-rate from fever in the town proper is shown by the figures of recent years given in p. 124 (p. 135 of abstract).

Cholera.—The total number of cases was 2,019. In 1891 the number of cholera cases were specially large (2,955) on account of the occurrence of the Ardhodaya Jog. In the suburbs there were 762 deaths from cholera, being the lowest number in the last five years. This satisfactory diminution is evidently connected with the extension of the filtered water supply which was fully introduced in the latter part of 1891; and the operation of cause and effect in the case is demonstrated to proof by a comparison between the cholera figures for the suburbs and Howrah, where there is no filtered water supply. Hitherto the death ratio from cholera in the suburbs and in Howrah has closely corresponded; but during the past year, though the ratio was specially high in Howrah, it fell to its minimum in the suburbs. Moreover, the year 1892 was a bad year for cholera all over Bengal, the death ratio being the highest since 1876. The comparative immunity from the suburbs is the direct result of the policy of the Commissioners in extending the water supply, and is a result on which they may justifiably congratulate themselves. The mortality from cholera was highest in March and in April, and was associated in these months with the assembling of pilgrims on the occasion of the Mahabaroonee Jog and with the Ramzan observance.

There were a few isolated cases of small-pox, the number of deaths from diarrhœa and dysentery has undergone steady decrease during the past four years.

The year 1892 may be described as a moderately healthy one.

Water supply.—Much discussion and some alarm was provoked in the past year by the appearance in the filtered water supply of a few specimens of unwelcome visitors in the shape of snakes, worms, and a species of delicate slender eel. It is satisfactory that the snake was of a perfectly harmless species, but the mode of its introduction, as also that of the eel, remains unaccounted for after careful investigation. The worms were of marine and estuarine species and came from the river. None of these organisms have been found during the present rainy season, and it seems probable that the cause of their introduction is not connected with any other cause likely to lead to contamination of the water supply. The Health Officer has reported fully on the subject on pp. 136–7 of his report.

On p. 125 of his report (p. 135 of abstract), the Health Officer refers to Mr. Baldwin Latham's recommendation to construct a new level outfall sewer (estimated at 13½ lakhs) to carry the sewage to salt lakes, and urges that an important matter of this kind "needs to be dealt with expeditiously." The project is not supported by their engineer, and the Commissioners are of opinion that the recommendation does not come within the region of practical politics at present.

The Health Officer calls attention to the wording of Section 315, which empowers the Commissioners to require owners to cleanse or fill up wells, tanks, &c., and the ambiguity in the section by which it is left uncertain whether or not the option to cleanse or fill up must be allowed to the owner, or whether it is for the Commissioners to prescribe his doing one or the other, without any alternative. In the opinion of the chairman (who under the section has the power of issuing notices, unless in any particular case the Commissioners deal with the case) the Health Officer's interpretation is correct. There is a difference of opinion on the point, however, among the Commissioners, many of whom take an opposite view which can only be authoritatively settled by legal decision.

The Health Officer has in forcible language drawn attention to the need of stricter building regulations for Calcutta. He maintains that masonry buildings are springing up everywhere on bustee lands without adequate provision for roadway; that the condition of these buildings is in consequence insanitary, because not only do they receive no ventilation, but they keep confined in a dangerous way the gases escaping from the adjoining sewers. He advocates that restrictions should be placed upon building in such cases until the owner of the land shall have made provision at his own cost of adequate roadway—a system which, he states, is insisted on in every other

country, and he recommends that a Building Act should be passed for Calcutta by the Local Legislature.

A very large majority of the Commissioners consider that, under the present law, there is ample power to regulate erection of proper buildings. A set of bye-laws was passed some years ago after careful consideration, but experience having shown their inapplicability to certain cases, the Commissioners have recently appointed a Committee to revise them, and they believe that, if proper bye-laws are framed, much of the complaint made in the Health Officer's report is likely to disappear. The Health Officer has referred to one particular case as to which it may be mentioned that, owing to exception being taken by the executive to the sanction granted by the Building Committee to construction of the building therein referred to, the Commissioners in meeting appointed a committee to consider the breadth of road required to be left before building should be sanctioned.

The majority of Commissioners are of opinion, therefore, that no sufficient grounds are put forward for the necessity of further legislation. The statement that the houses which are sometimes built on bustee lands are worse than the old bustees (which have been condemned by the Health Officer so frequently in well-remembered terms), is a statement which the Commissioners are not prepared to accept. It is indeed impossible to hold that the houses which have been built upon the site of *bustees* are far more insanitary than the *bustees* were. The brick-built houses are inhabited by a more respectable class of the people. Their habits are more cleanly. They are accustomed to a better mode of living. These things would in themselves make a vast difference between the *bustees* such as they were and the brick-built houses by which they have been replaced.

The cautious way in which the bye-laws have been worked have gone far to reconcile public feeling to them, and any hasty attempt at legislation must be deprecated by the bulk of the Commissioners as much in the interests of sanitary reform as out of deference for public opinion. The Commissioners are as eager for sanitary improvement as their Health Officer. But they are fettered by considerations which the Health Officer need not recognize. They have to take a practical view of the situation. They have to reconcile the interests of sanitation with the state of public opinion, and they feel from their past experience that they must proceed cautiously, and that a Building Act which would be resented by public opinion would not only prove a great hardship to the people, but would be practically inoperative.

The Commissioners in this connection would recall the words of Sir Ashley Eden in the Resolution of the Administration Report for 1876. Speaking of the remarks of their former Health Officer, Dr. Payne, he wrote:—"Mr. Eden is persuaded that "to make sanitation efficient in Calcutta, the people of the city must be led, and not "driven, into co-operation with the Sanitary Department. Dr. Payne should bear in "mind that one case in which native society is induced by conviction to adopt a "sanitary theory is worth hundreds of cases in which they are pressed into submitting "to reforms of the benefits of which they are not satisfied. The Sanitary Officer "must remember that the principles and theories which to him seem so obvious and "indisputable, have not even yet received practical acceptation in many countries in "a much more advanced condition of social progress than India. In some of the "finest cities in civilized Europe, with every appliance and convenience for sanitary "improvement available, there are streets, lanes, and houses whose description, if "faithfully given, would throw into the shade the vivid pictures of the filth of "Calcutta so graphically drawn by Dr. Payne."

The general question involved is one on which the most opposite opinions have been entertained among the Commissioners. Opinion is divided into two schools on much the same lines as it is divided on the same subject in London and other towns in Europe.

The one school—whose views are represented above, and they form the large majority of the Municipal Commissioners—holds that whatever land is required to be taken up for roads, should be acquired at public cost, and that to require the owner to give up land and prevent him from making the profit out of it, which he otherwise could make, amounts to unjustifiable confiscation. They point out that town property has been continually changing hands without any such disabilities attaching to the possession either existent or in prospect, that the ownership of town land is in many cases in the hands of very petty and numerous shareholders, and that it is impossible for them to enter into mutual arrangements that shall be equitable to all to give up lands for roadway. In short, it is contended that any attempt to get broad streets made in new localities otherwise than at the public cost would be spoliation.

The opposite school, on the other hand—which comprises a small minority of the Commissioners, including the Officiating Chairman—contend that the municipal income must for ever be inadequate to the burthen which the other party would impose upon it; that inasmuch as the value of a town property is enormously enhanced by the construction of a street with necessary drainage provision, it is not equitable that the ratepayer should bear the whole cost; that if no restrictions have hitherto been imposed and property has changed hands free from such restrictions, this result has been due to carelessness, and that, in view of the dangers to the public health from the present system which the Health Officer has pointed out, a change in that system is imperatively called for. It is pointed out that the value of land is increasing annually in Calcutta, largely owing to Municipal improvements, and that the longer the question is deferred, the more difficult of solution it will become. It is admitted that no legislation should be passed without the most careful preliminary inquiry so as to prevent injustice to individuals, but it is strongly urged, on the other hand, that. on the general principle that property has its duties as well as its rights, and that, in the case of property in an overcrowded city, interference is necessary for the common weal, the State should place such restrictions upon building, even at the cost of diminishing the value of town property to its immediate possessor, as may be essential for the public health.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF CALCUTTA FOR 1892.

(*Dr. W. J. Simpson.*)

Births.—The number of births recorded during the year 1892 is higher than that registered during the previous three years. There were 12,688 births, giving an annual ratio of 18·6, which is the highest birth-rate since the town and suburbs were amalgamated. The figures are as follows :—

Year.	Number of Births.	Birth Rate.
1889	12,317	18·0
1890	11,918	17·4
1891	12,477	18·3
1892	12,688	18·6

The increase is due to a steady improvement in the birth-rate of Suburban Calcutta. This is shown in the subjoined table :—

Year.	Urban Calcutta.		Suburban Calcutta.	
	Number.	Ratio.	Number.	Ratio.
1889	8,752	18·7	3,565	16·1
1890	7,948	17·0	3,970	18·4
1891	8,256	17·6	4,221	19·6
1892	8,123	17·4	4,565	21·2

The causes of this difference are probably of a complex nature, and any explanation in the absence of more accurate information must rather partake of general references to Suburban Calcutta, on the whole being more residential in its character than Urban Calcutta. The peculiarity of Calcutta, as regards its small number of residential females as compared with that of males, combined with the constant migratory habits of its population, does not permit of any useful comparison of its birth-rate with other towns.

Deaths.—The number of deaths in 1892 was lower than that of the previous two years. There were 20,180 deaths in 1892 against 21,577 in 1891, being a decrease of 1,337 deaths. The subjoined table gives the figures and ratios for the past four years :—

Year.	Number of Deaths.	Death Rate,
1889	19,564	28·7
1890	20,368	29·8
1891	21,157	31·5
1892	20,180	29·6

The decline in the death-rate during 1892 was mainly due to fewer deaths in the suburbs as compared with the previous year. There were in Urban Calcutta 359, and in Suburban Calcutta 978 fewer deaths. The following statement shows the numbers

of deaths in each of these divisions of the town with its death-rates for the past four years :—

Year.	Urban Calcutta.		Suburban Calcutta.	
	Number of Deaths.	Ratio.	Number of Deaths.	Ratio.
1889	11,682	25·0	7,882	36·6
1890	12,382	26·5	7,986	37·1
1891	13,033	27·9	8,484	39·4
1892	12,674	27·1	7,506	34·8

It will be observed that the death-rate in the suburbs for 1892 is the lowest since the amalgamation. It has been previously mentioned that the suburban birth-rate for 1892 was the highest recorded. These two facts, when taken together, indicate that the health of Suburban Calcutta has distinctly improved during the past year. As to Urban Calcutta a similar satisfactory account cannot be given. The death-rate for 1892 is slightly lower than for 1891, the ratios being for the respective years 27·1 as against 27·9, or 359 deaths fewer in 1892 than in 1891. But 1891 was an exceptional year. The *Ardhodaya Jog* which occurs only once every 27 years happened then, and was the immediate cause of a large number of deaths among the pilgrims who streamed into Calcutta on that occasion. If this influence therefore be considered and discounted, the public health of Urban Calcutta in 1892 was no improvement on that of 1892. The high mortality in Calcutta is mainly due to the great prevalence of fevers.

The relative death-rates according to nationality were Christians, 20·5; Hindoos, 29·5; Mahomedans, 30·0; other classes, 44·9.

The birth-rate and mortality varied greatly in the different wards. In the northern portion of the town, Jorabagan had a birth-rate of 8·9 and a death-rate equal to 29·0, while Burra Bazar had a birth-rate of only 4·6 and a death-rate of 26·5, a certain reduction having taken place in the death-rate of this ward in consequence of the construction of the new Harrison Road. In the southern portion of the town Waterloo Street ward, which is the European business quarter, had a birth-rate of 4·6, and a death-rate of 13·3. It is worthy of notice that Hastings is the only ward where the birth-rate exceeded the death rate. The highest ratio in any of the wards was in the added area of Burtollah, which recorded a birth-rate of 36·9 and a death-rate of 44·1. The added area bordering on the Circular Canal as a whole showed a high mortality. The district is low-lying, crowded with people, has a very large number of filthy tanks and is very unclean. The people also are more residential; they die here, whereas in many other wards they go home to die. Its cholera-rate and fever-rate were very high. The former was due mainly to its contaminated tanks, every one of which should be filled up as soon as possible. Cleansing tanks of this description is a mere waste of time and money with no sanitary effect whatever. A good deal of its fever was also due to the same cause, though some of it may fairly be attributed to the absence of drainage. No scheme of drainage, however, should be introduced until a Building Act, regulating the construction of buildings and the laying out of streets, is put into force. To introduce drainage in such a locality, without first constructing roads, is useless and dangerous. This locality in the amalgamated suburbs demands particular attention. If this added area be excluded, and the fever-rate of the other wards be examined, it will be seen that for the year Alipore with no drainage had a less fever-rate than any of the northern wards with all its underground drainage, and that the Watgunge ratio was also below that in most of the northern wards, though the former ward has no drainage. The difference even in the highest ratios was not so marked as it should be. The beneficial effect of underground drainage is marred by the crowding together of buildings and the narrowness of streets. With these unfavourable conditions it is impossible to lay down a system of drainage which shall work with efficiency and without danger. The dangerous element is this, that wherever a crowded area exists, the population being greater than the area can accommodate with safety, the resources of any drainage which may be laid down, having due regard to the area to be drained, are so heavily taxed by the waste products to be removed, that stagnation inevitably results, and injurious gases pass into the air with the well known disastrous consequences, whereas with wide and straight streets and a population proportionately diminished, sewerage and drainage would be effective in removing the poisonous products.

The deaths from fevers continued high, though there was a slight decrease when compared with the previous year. There were from this cause 7,618 deaths in 1892 against 7,851 in 1891, 6,792 in 1890, and 5,994 in 1889. The decrease in 1891 was chiefly in Suburban Calcutta; the figures for Urban Calcutta remained nearly the same. The rise of fevers in Urban Calcutta during recent years is seen from the following table:— Fevers.

1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.
3,618	3,442	3,618	3,831	3,422	3,253	3,198	3,334	4,154	4,675	4,632

In previous reports the local insanitary conditions which engender fevers in Calcutta have been sufficiently dwelt on, and it is only necessary to state in this report that, combined with crowding together of huts and houses, one of the most important of these conditions is the unsatisfactory state of the underground drainage in Urban Calcutta, by which the soil and subsoil are being constantly polluted, and which, if permitted to go on unheeded, will, ultimately, under favouring climatic conditions, have a most disastrous effect on the public health of the city. It is over two years now since Mr. Baldwin Latham, a sanitary engineer of great experience, pointed out in a most lucid manner the radical defects which rendered the underground drainage of Calcutta dangerous to its inhabitants. An important matter of this kind needs to be dealt with expeditiously, and I would therefore again strongly recommend that action be taken on the basis of Mr. Baldwin Latham's report; for, the sooner the defects in the sewerage system are remedied the more speedy will danger from this cause be averted, and a reduced death-rate be attained so far as the latter is dependent on this cause. The chief remedy lies in the provision of a low level outfall sewer. This is a remedy which unfortunately involves a heavy expenditure, so that in the present financial position of the municipality the undertaking of such a work is one of great difficulty, and one which may well cause the Commissioners to hesitate before coming to an definite decision. On the other hand, the matter is so important that it is impossible not to urge that a beginning should be made. A very considerable time must necessarily elapse in preliminaries, as in the procuring of the necessary information and the preparation of plans and estimates, and, perhaps when these are ready, the finances will be in a firmer condition than they are at present, and the work can then be commenced. In Suburban Calcutta there is no drainage to carry off the increased quantity of waste water which has resulted from the introduction of the new water supply, and accordingly a portion of the fever mortality is due to the increased water-logging of the soil. The Commissioners have, however, thoroughly appreciated the evils likely to accrue from an absence of drainage in the suburbs, and have resolved to proceed with the surface drainage of that area as being the most important sanitary work required therein. A special establishment has been entertained, plans have been drawn out, and every preparation is being made to begin the work. The suburbs have undoubtedly derived an immense benefit from the new water supply, and there is every reason for hoping that a considerably further improvement in the public health will take place when the surface drainage is completed. The introduction of the contemplated surface drainage in conjunction with what already has been done, viz., destruction of the refuse by burning, and the introduction of a pure water supply, will form a sanitary epoch in the history of the suburbs. And the Commissioners are to be heartily congratulated on the great progress which these extensive undertakings represent, and the more so inasmuch as these improvements have all been conceived within the past five years since the amalgamation with the town.

In 1892 there were 2,019 cholera deaths against 2,955 in 1891. The following statement gives the number of cholera deaths for the two main divisions of the town during the past four years:— Cholera.

Year.	Total.	Suburban.	Urban.
1889	2,315	1,236	1,079
1890	1,879	916	963
1891	2,955	1,402	1,553
1892	2,019	762	1,267

In both divisions the year 1891 had the largest number of deaths, which was shown in previous reports to be due mainly to the *Ardhodaya Jog* in the month of February. The low figure of 762 for Suburban Calcutta in 1892 may be considered to be largely the result of the water supply introduced in 1890. The influence of the newly introduced water supply is shown more clearly in the following table, where the deaths of each year for February are placed in a separate column :—

Years.	Total Calcutta.			Urban Calcutta.			Suburban Calcutta.			Remarks.
	Total.	Feb.	Remaining months.	Total.	Feb.	Remaining months.	Total.	Feb.	Remaining months.	
1888	3,121	293	2,828	1,734	182	1,552	1,387	111	1,276	
1889	2,312	213	2,099	1,076	94	982	1,236	119	1,117*	* Opening of Halliday Street works on 12th March 1889, and extension of town supply into suburbs in September.
1890	1,879	313	1,466	963	217	746	916	96	820	Opening of Bhowanipore works in Suburbs in August 1891.
1891	2,955	1,156	1,799	1,553	523	1,030	1,402	633	769	Ardhodaya Jog.
1892	2,019	125	1,894	1,257	85	1,172	762	40	722	

It will be seen that the number of deaths in February, for 1891, both in Urban and Suburban Calcutta, is extraordinarily large, and that for Suburban Calcutta the cholera mortality during the total remaining months of the year, when compared with the corresponding months in other years, shows a marked decline. The fall is quite irrespective of drainage, for there is no drainage in the suburbs.

In connection with the fall in the number of deaths from cholera in the suburbs, and the consequently small number of cholera deaths in 1892, it is worthy of note that Howrah recorded in 1892 not only the highest number of cholera deaths for the past decade, but for any year since 1873, when registration was first introduced into that town. This is a very important fact, and an equally important one is that Howrah hitherto has never suffered to the same extent as suburban Calcutta, the reason being that it has never been exposed to the same incessant infection. The suburbs of Calcutta contain the celebrated Kali's Temple to which pilgrims come at all seasons from all parts of India, and more especially of Bengal. On occasion, as in the instance of the Ardhodaya Jog, the pilgrims come in thousands, and at those times especially there is imminent danger to the inhabitants. Whether the pilgrims be few or many, cholera is seldom absent from Kalighat, and the infection very frequently spreads from this centre. The numerous tanks in the suburban area are thus liable to be more often contaminated than those on the Howrah side of the river, and the consequence has been that the suburbs have always been not only an endemic area, but also an epidemic area. The dark red belt of cholera which surrounded Calcutta and which marked the suburbs out on the map, as being peculiarly cholera-stricken, has suddenly disappeared. Can this sudden change be attributed to climatic influences? If so, Howrah should share in some degree in the improvement, for the climate of Howrah differs in no essential respects from that of suburban Calcutta. Except for municipal purposes, the two areas are practically parts of the same town, one being on the east of the river Hooghly, the other on the west. Their topographical conditions are alike, their inhabitants live in the same manner, bustee land predominates in both areas, and foul tanks are the characteristics of each. With such similar conditions, exposed to like climatic influences, they are excellent areas for comparison regarding cholera prevalence. Under these circumstances, climatic influences would be expected to show some uniformity in their results in both areas, and, as a matter of fact, this is the case. There is always a synchronicity between the cholera-rate of Howrah and that of suburban Calcutta. The same climatic conditions, which are favourable for the reproduction of the cholera germs in Calcutta, favour their reproduction in Howrah, and the climatic conditions which are hostile in the one, are hostile in the other. Thus it happens that, when the cholera ratio rises in one area, it also rises in the other; and when it falls in one it falls in the other. Each is the cholera barometer or index of the other: the only difference noticeable has been that hitherto Howrah has always had the advantage of fewer cholera deaths per 1,000 of the population, and consequently always a lower ratio than the suburbs. The cause of this has been already explained. This rising and falling together has, however, undergone a change, as seen by the following table :—

Years.	No. of Deaths in Howrah.	No. of Deaths in Suburbs.	Years.	No. of Deaths in Howrah.	No. of Deaths in Suburbs.
1888 - -	598	1,387	1891 - - -	490	1,500
1889 - -	488	1,236	1892 - -	771	762
1890 - -	364	960			

During the years 1889 and 1890, there was in both areas a steady decline marked more in 1890 in the suburbs than in any previous period. Then in 1891 there was a rise in both areas. The cause of the great rise in the suburbs has already been shown to be due to the Ardhodaya Jog. Lastly, in 1892, the Howrah ratio rises still further, and to such an extent as to record one of the highest death-rates from cholera from which it has suffered since registration began. But not so the suburban cholera ratio, which instead of rising and exhibiting one of the highest ratios recorded, has taken exactly the opposite course, and declined until the ratio is one of the lowest that has been noted. Further, the population of the suburbs is twice that of Howrah, and yet the number of cholera deaths in Howrah for 1892 is more than the number of deaths for the suburbs. Such a relationship has never been known to exist before. If the suburbs had responded in a similar manner as previously and as had hitherto been usual, then with 771 deaths in Howrah there should have been over 2,000 in the suburbs, whereas there were only 762. After having reached in 1890 a low figure, the Howrah cholera ratios of 1891 and 1892 have been following their ordinary course in ascending, but the suburban ratio has broken away from its ordinary course, and, instead of ascending in 1892, has suddenly fallen. Clearly climatic influences have not raised the Howrah ratio to the highest which has been for many years past, and simultaneously depressed the suburban ratio to the lowest on record. Evidently, something unusual has occurred to put a strong check so far as the suburbs is concerned, on the natural tendencies of climatic influences which, in relation to cholera endemicity, have hitherto worked together on Howrah and the suburbs, and which has at the same time disturbed the harmonious rhythm which existed formerly as regards cholera prevalence in these two areas. Climate being thus eliminated, to account for the reduction in the suburbs, other known factors have to be considered which may have had the effect. Of these it is not the introduction of drainage, because fortunately for the sake of comparison neither area has been drained. There can, therefore, be no discussion concerning the influence which the drainage has had in the reduction of cholera similar to that which took place, and confused the issues when an equally marked reduction was recorded in the town of Calcutta in 1870 on the introduction of the water supply. In Howrah and the suburbs of Calcutta, the fact of there being no drainage in either simplifies the question. The only great difference now existing between the two areas is the presence of an agent in the suburbs, which, wherever it has been introduced, has always been followed by a precisely similar effect. That agent is a pure water supply. Many of the inhabitants of Howrah send across the river to Calcutta for their water supply, but a large portion of the inhabitants still depend on their tanks for their drinking water. In 1892 the suburbs of Calcutta had a fair supply of good pure water, while Howrah had a tank supply, some of which was drawn from the river from a source not above suspicion. This is the difference; and the circumstance adds one more fact to the constantly accumulating evidence as to the important role which contaminated water plays in the spread and prevalence of cholera. The water supply of the suburbs was not introduced in 1892, but in the latter part of 1891. Its effect was immediate over the whole area of supply, and there was, as has been shown by the former figures, a marked reduction in the monthly deaths. There had been a decline even previous to this, because a large portion of the suburbs had the town supply extended to it in the latter part of 1889, though the Bhowanipore pumping station was not completed until August 1891. In 1891, notwithstanding the extraordinary gathering at Kalighat, the deaths from cholera in all the months except February were very much reduced, and in 1892, when the ordinary conditions prevailed, the deaths declined to an extent which they had never reached before; while in Howrah, whose cholera ratios have always ascended and descended simultaneously with the suburbs, the ratio was exactly reversed, and the deaths rose above all previous records. In this connection it is also to be noted that Howrah only followed the general ratio for Bengal which was the highest since 1876, no fewer than 259,398 deaths from cholera being recorded. The extraordinary fall in the suburbs is therefore of peculiar significance.

The reduction would doubtless be more conspicuous were the polluted tanks of the suburbs not so numerous. In a previous report one of the chief causes of the cholera prevalence among the pilgrims in February 1891, was attributed to the use of contaminated water. In view of the constantly accumulating evidence of polluted water and its influence on the endemicity of cholera in Calcutta, it is of paramount importance that no relaxation should be permitted in the work of filling tanks. It has been recently contended that the owner of a tank injurious to health is not obliged to fill up that tank when called upon to do so by the commissioners, but that the clause in the Act gives him the option of cleansing or filling up. The section 315 is as follows :—

"When any well, tank, or marshy ground, or any waste or stagnant water, whether within any private enclosure or not, appears to the Commissioners to be injurious to health or to be offensive to the neighbourhood, the Commissioners may require, by notice in writing, the owner of the same to cleanse or fill up such well, tank, or marshy ground with suitable material, or to drain off or remove such stagnant water; and if he shall refuse or neglect to comply with such requisition during one month from the service thereof, the Commissioners may enter into the said premises, and do all necessary acts for all or any of the purposes aforesaid as they shall think fit; and the expenses thereby incurred shall be paid by the owner, and until so paid the Commissioners may retain possession of the land, or tank, or the site of such tank, and utilize the same for public purposes."

The option of cleansing or filling up has hitherto always been construed to belong to the commissioners, and I know that this was the intention of the framers of the clause. This point therefore requires to be settled definitely, because if the option lies with the owner, the work of filling up tanks for all practical purposes comes to an end. And as the abolition of wells and tanks in Calcutta is a sanitary measure of the first importance, powers to enforce this should be immediately obtained. Owing to the peculiar treatment to which the tanks of Calcutta are subjected, and the impossibility of preventing their pollution in crowded localities or in bustees, any relaxation in the course formerly adopted of insisting on their being filled up, can only end in injury to the public health. As to the wells it may be safely said that there is not one of them in the town fit for domestic use; they are a continual source of danger to those who use them, and like the tanks require to be systematically filled up without exception.

Small-pox. The year 1892 was a non-epidemic year, and the few isolated cases of small-pox which occurred in the town and amalgamated area were mostly imported cases. The deaths from the disease numbered only 21, against 18 in 1891.

Bowel complaints. There were 2,364 deaths from diarrhœa and dysentery in 1892 against 2,716 in 1891. During the past two years there has been a marked reduction in the number of deaths in Suburban Calcutta, as is shown by the following figures :—

1889.	1890.	1891.	1892.
1,425	1,448	1,283	1,086

A portion of this diminution may fairly be attributed to the new water-supply now used by the inhabitants generally for drinking purposes, in place of the foul water from the tanks which abound in the suburban area.

Other causes. The total number of deaths from all other causes was 8,158 against 7,977 in 1891, being slightly higher than the average of the preceding three years. The increase was mainly due to a larger number of deaths occurring in Urban Calcutta.

Special Sanitary Matters.

There are some sanitary matters which deserve special attention and call for particular remark. Among these are the water supply and its infection with snakes, the necessity for a Building Act, the importance of abating the nuisance at Goragatcha trenching ground, the need of ambulances, the impossibility of proper scavenging of the town, without restriction of the hours at which the inhabitants shall be permitted to throw refuse into the streets, the erection of the Goragatcha incinerator, and the purchase of a disinfector.

Water supply.—Considerable anxiety arose in the minds of the inhabitants of Calcutta during the second quarter of 1892 from the presence of snakes, worms, and eels in the water supply of the City. Reference was made to the late Mr. Wood-Mason,

then Curator of the India Museum, who pronounced the snake to be a typhlops and perfectly harmless. It is common enough in Calcutta, but this was its first appearance in the water supply. Some 20 or 30 snakes came from the filtered water taps during the quarter. A curious coincidence was the appearance about the same time of marine and estuarine worms in the unfiltered water supply. No difficulty was experienced in proving that the worms in the unfiltered water came from the river. The most diligent search, however, as to the manner in which the snakes gained an entrance into the filtered water was unsuccessful. They did not come from the river near Pultah, for they were not found in the filter beds; and Barrackpore, which is supplied with the Calcutta water immediately after filtration, was free of them. The several reservoirs in the town were examined, but they furnished no satisfactory solution of the problem as to the presence of the snakes in the pipes. In the compound of the Tallah pumping station similar snakes were found under a heap of rubbish, but some distance from the reservoir. A single specimen of the typhlops was found adhering to a ledge in the Wellington Square reservoir when it was opened and examined; but how it got into the reservoir is not known. Another still more curious coincidence was the presence of specimens of delicate slender eels in the filtered water supply from the second week of June, *i.e.*, soon after the appearance of the snakes from house-taps had been noted. The manner in which the eels gained access to the water pipes has hitherto remained a mystery. Two explanations suggested themselves at the time; the first was the possibility of a nest of snakes having gained access to the pipes in the process of pipe-laying, specially in the new Harrison Road and in the suburban area; the second was the liability of suction into the mains when the pressure was taken off for the night. The chance of contamination of the Calcutta filtered water supply is much more than a possibility, and likely to arise with an intermittent system. The snakes and eels in the water supply may not have been in themselves very important; but if snakes and eels were able to gain an entrance from the outside, no security can be felt against the occurrence at any time of a sudden contamination of the water by something much more injurious to the public health. It is satisfactory, however, to be able to report that the cleansing of the reservoirs and structural alteration remedying every defect found in them, whereby the snakes might possibly have reached the reservoirs, were followed by the disappearance of the snakes during the rest of the year. With the object of improving the water supply a very important work was begun this year at Pulta, in the shape of two new settling tanks. When these are completed the water pumped from the river will have a longer time to settle before being decanted on to the filters, which by the present arrangements are put to an undue strain especially in the rainy season, when at times the water supply is not so pure as it should be; so much is this the case that it is advisable for the public to boil the water during the rains.

A Building Act required for Calcutta.—Again, it is necessary to draw attention to the law as it stands regarding streets and buildings. That in force is not merely a defective law, but a radically bad one, for under its sanction unhealthy houses are being built, whilst areas in the town are being created which, as they grow, can only breed pestilence. In 1889 I gave a very full report on this subject, and the Bengal Government resolution on that report endorsed the opinion that the ventilation of the City by proper streets and squares, and the enforcement of proper building regulations were the most important sanitary measures which remained for the Municipal Commissioners to undertake; and in paragraph 16 of the same resolution the Lieutenant-Governor expressed his hope that the suggestion of the Health Officer for the appointment of a suitable committee to investigate and report upon the subject with the object in view of the framing of a Building Act would receive very early attention. Three years having elapsed without any action being taken in this direction, it becomes a duty to urge the early adoption of a measure of such vital importance. The deterioration in health conditions of certain localities during the past few years is very marked, and nothing can stop this deterioration, while the present law remains in force. When a house may be built anywhere without reference to efficient ventilation, proper drainage, or surroundings, when it may be built in any lane or passage irrespective of the width of that lane or passage, and when it may be built in such a manner as to permit it to obstruct the light and ventilation of the neighbouring houses so long as it is 4 feet away from them, no long time is necessary under this regime to create plague spots in different parts of the town. Such a process is going on continuously now, and while that process is allowed to continue, the money spent on the new Harrison Road and on the lanes which are constructed through bustees will have but a poor return, because the destruction of insanitary areas which is effected

by new roads and lanes can never even keep pace with the progressive creation of areas much worse in type. A Calcutta bustee, as it used to be, even with its drawbacks, is infinitely preferable to what is now springing up in its stead. At one time a landlord let the whole of his land for bustee purposes, and one-storied huts as a rule were built on every available space. The huts were built irregularly and according to the requirements of the hut-owner. The spaces between the huts served generally as passages, but occasionally the owners left sufficient space for the purposes of scavenging and cleansing the bustee. Drainage and ventilation were left to themselves, and as always happens when too large a population is crowded on too limited a space without reference to sanitary conditions, these bustees became very unhealthy and the source of epidemics. Bustee improvements accordingly became an important factor in the sanitation of Calcutta. At an enormous cost narrow lanes have been put through a number of the largest and drainage laid down. While, however, some advance has been made in this direction, a new development has taken place. The land of bustees and of vacant spaces is being sold in small plots, and each owner of his plot is building a brick building upon it. The outcome of this system is that, instead of bustees consisting of huts, bustees consisting of brick buildings are being erected. Now, as formerly, no one thinks of roads or streets. Every piece of land purchased is bought to be covered with a building. The objections against a bustee crowded with huts, regardless of the slightest attempt at sanitation, are infinitely greater against a bustee of brick buildings. In the majority of the former the huts were only one story in height, they had a large courtyard open to the sky, they were built of bamboo with mud-plastered walls, and the work was of such a kind that air could get into the rooms from creeks and corners everywhere. The sun had access to the courtyard and its powerful rays lessened, or even prevented to a great extent putrefactive processes set up by the needs and dirty habits of the inmates, and thus largely protected them from the results of their own ignorance by which every law of health is violated. But the bustees and areas of land covered with brick buildings on the new plan, or perhaps more accurately the plan copied from Jorabagan, will not have these advantages. The houses are at least two stories high, many of them have no courtyard, and those that possess one, have it contracted to the smallest limits. The influence of the sun is diminished, and the ventilation is reduced. The houses, shut in on every side from the perflation of the wind, become veritable hot-beds of disease, and will inevitably get worse. The effect of a pure water supply in these districts can only be palliative. It is doubtful whether such drainage as is possible is of any real and lasting service. As I have stated in former reports, no proper drainage can be introduced into such localities. Sanitary science knows of no method by which areas of this description can be rendered healthy. All that can be done is to pull the houses down and begin on new lines. This being so, it may with reason be asked why such a system is permitted to continue, and evils perpetuated which can only end in a calamity. Water supply and drainage, however good in themselves, are not the panacea for every disorder to which the public health is subject, nor will they prevent diseases due to impure air, or the absence of the purifying effect of the sun. Pure air can only be obtained in Calcutta by open spaces, wide and regular streets, and efficiently ventilated buildings. Under these conditions drainage and cleansing can be effective and beneficial. But under the opposite conditions the forces, favouring the generation of disease, are stronger than those directed to their prevention. Time and season are the only factors wanting to ensure disaster. Nothing but a Building Act on comprehensive lines can deal with this important problem. With a good Building Act Calcutta would have the chance of ultimately becoming a healthy city. The process would be slow, but the progress would be sure. A very large portion of the city is still in the condition of bustee land, and accordingly it is quite easy to prevent the sale of this land or other kind of land for building plots until proper streets are laid down by the owner. This system is only that which is insisted on in every other country. *Roads with a minimum width of 40 feet are absolutely essential to ensure a healthy condition of the houses abutting thereon.*

Vaccination.

The total number vaccinated during the year 1892 amounted to 14,050. Of these, 12,281 were cases of primary vaccination and 1,769 of re-vaccination. The corresponding figures of the previous year were 10,875 and 2,906, respectively. This shows an increase of 1,406 in primary vaccination, and a decrease of 1,137 in re-vaccination. The decrease in re-vaccination was due to the absence of small-pox

during the greater part of the year. Of the 12,281 cases of primary vaccination 11,332 or 92·27 per cent. were successful, and 358 or 2·91 per cent. were unsuccessful, and in 591 or 4·81 per cent. the result was not ascertained. In primary cases the rate of success calculated on the ascertained cases was 96·93. Of the 1,769 cases of re-vaccination, 454 or 27·66 per cent. were successful and 1,241 or 70·15 per cent. were unsuccessful, and in 74 or 4·18 per cent. the result was not ascertained. The rate of success on ascertained cases in re-vaccination was 26·80. The rates of success on ascertained cases in 1891 were 92·87 and 27·31, respectively. Of the total number vaccinated during the year, 7,529 were males and 6,521 females. According to nationality, 542 were Christians, 9,471 Hindoos, 3,960 Mahomedans, and 77 other classes; and 4,702 were under 1 year of age, 7,383 were 1 year and under 6 years, and 1,965 were 6 years and upwards.

Vaccination is carried on in Calcutta under the provisions of the Compulsory Vaccination Act. The Registrars of births issue notices to parents or guardians of children at the time of registration to have the children vaccinated within one year. When a child is successfully vaccinated, a certificate to that effect is given to its parents, and the duplicate of it is sent to the Ward Register, who thereupon makes an entry in his birth register under the column "vaccination" to show that the child has been vaccinated. The Registrars submit to the Health Officer monthly statements of persons of whose children they do not receive certificates of successful vaccination within one year of birth. By such monthly statements they submitted during 1892 the names of 10,642 persons who failed to produce the statutory certificates of having had their children vaccinated. All these cases were inquired into by the vaccination department with the result that 5,929 were traced and vaccinated, 1,505 were found to have left town or changed abodes, 796 were not found at the addresses given, 873 had died, 1,288 were ill, had small-pox, and 247 were prosecuted and vaccinated by order of magistrates.

Under the powers conferred on the vaccinators by the amended Act, house-to-house inquiry for unprotected children was daily made by the male and female vaccinators in the town and amalgamated areas, and where children over one year were found, notices were issued by the department direct to parents or guardians to have them vaccinated within 15 days. In this way nearly 1,600 notices were issued during the year 1892. Most of the people served with notice got their children vaccinated, but 169 had to be prosecuted. In certain localities and among certain classes, such as the up-country Marwaries of Burra Bazar and Jorabagan, great difficulty was experienced in obtaining the names of parents, and hence these could not be adequately dealt with by law. Vaccination is making slow progress amongst these classes. Besides the above, 212 persons were prosecuted for neglect to bring vaccinated children for inspection; so that the total number of prosecutions under all heads amounted to 618 during 1892 against 543 during the preceding year. Vaccination is systematically carried on in all sections of the town and amalgamated areas. But the degree of protection in each ward varies with the character of its population. The wards inhabited by Europeans and resident Bengalees are generally better protected than those inhabited by up-country people. The Vaccination Act enables the vaccinators to push on vaccination amongst the lower classes of up-country men, but the upper classes are very difficult to deal with, and vaccination is making very slow progress amongst them.

In Calcutta both the humanized and animal virus was kept up by regular transmission and used all the year round. The animal virus was replenished in March last by inoculating a calf with small-pox virus. The vaccine from this calf was transferred to a second calf, and from this calf to children. The lymph from these children was used in vaccinating calves as well as other children, and the result was great improvement in the rate of success with both animal and humanized virus.

ABSTRACT OF REPORT OF THE MADRAS MUNICIPALITY FOR 1892-3.

(*Lieutenant-Colonel G. M. J. Moore, President.*)

Drainage.—Black Town Drainage.—The following works have been carried out :—All the cesspools at places where the sewer in Popham's Broadway overflows into the old main drain were re-constructed, and the level of overflow raised in order to prevent frequent overflows occurring, but it has not yet been found possible to prevent sewage from entering into old main drain, though the quantity has been considerably reduced.

Constructing a cesspool at the junction of Annah Pillay Street and Adiyappa Naick Street.

Cutting off sewage at Monegar Choultry Slaughter-house from entering old main drain and connecting with No. 2 sewer.

Other Drains.—The following works were completed during the year :—

Constructing a covered drain from Egmore paddy fields to Pantheon Road.
Do. 9″ cross drains in Adam Sahib Street, northern section, and a cesspool at the junction of Thoppay Moodelly Street, and Cemetery Road.
Laying 9″ stoneware pipes in Peddoo Naick's Lane.
Constructing 12″ and 15″ drains on south side of Andiappa Moodelly Street.
Do. 12″ drain on the north side of Venkatakristnen Street.
Do. 6″ masonry drain in Dancing Girls' Street.
Do. 6″ and 9″ masonry drains in Bala Aroonachella Chetty Street, 1st division.
Do. a 6″ tile drain in Adam Sahib Street.
Do. tile drains in Pathala Vigneswarer Covil Street.

The work in connexion with 6″ tiled drain in Thotticalay Comarappa Moodelly Street will be completed early next year.

The work of extending the outfall pipe 3,300 feet has been postponed pending further consideration.

Water-Supply.—Mr. E. Cousin's Report referred to in last year's Administration Report has not yet been received.

A plan of the Red Hills Channel showing position of demarcation stones has been furnished by the Revenue Survey Office. Private connections have been allowed from 1st November 1892, having been disallowed for the previous 15 months.

During the year under report, 2,530 yards of pipes were laid, and 9 fountains, 6 valves, 12 stop-cocks, and 2 hydrants were fixed within the municipal limits.

On the 1st April 1892 the level of the Red Hills Lake stood at 37·31 and at 38·85 on the 31st March 1893. On the 4th of May the level of the lake at Red Hills fell to 35·63 when pumping was commenced, and was continued until the 28th August.

The quantity of water supplied to the city during 1892–93 was 326,856,762 cubic feet, as compared with 327,888,049 cubic feet in the previous year.

During the year 1,147 new services were laid by licensed plumbers, and 972 existing services were extended.

The rate of water supplied for non-domestic purposes has been four annas per 1,000 gallons throughout the year.

Conservancy. No change was made in the system. Carts, bullocks, and drivers were supplied by the same contractor, and labour was supplied and paid for departmentally, as in the two previous years. The President's proposal, that the commissioners should take the carts into their own hands and thereby effect a considerable saving, which was recommended by the Scavenging Cess Committee and accepted by the Commissioners as a part of the Committee's report, was brought before a general meeting, and it was proposed that a loan of Rs. 50,000 be raised for the purchase of conservancy carts. This was lost after a Committee had reported against it.

Vaccination.

During the year 1892–93 the total number of cases vaccinated was 24,858 against 26,493 in 1891–2, showing a decrease of 1,635 cases. In comparing the work, if the vaccine operations done by the medical subordinates in the Penitentiary in 1891–92 be excluded from the total, then the number of cases operated on during the year under review shows a decrease of only 244 cases. The decrease was due to fewer children being born, and to the fact that many children brought to depôts for inspection were found unfit to be vaccinated. Vaccination was postponed for this reason in 868 cases. Out of 24,858 cases, 24,299 were successful, 204 unsuccessful, and 355 unknown. The unsuccessful and unknown results were less than those of 1891–92 by 379 and 551 respectively, and this was due to the weekly inspection of the vaccine operations performed among the convicts in the jail and the verification of results of the Natal emigrant coolies.

The following is a comparative statement of results of 1891–92 and 1892–93.

Year.	Total vaccinated.	Compared with the preceding Year.		Successfully vaccinated.	Percentage of success, excluding unknown.
		Increase.	Decrease.		
1891–92 - -	26,493	—	—	25,004	97·72
1892–93 - -	24,858	—	1,635	24,299	99·16

The percentage of primary and re-vaccination successful cases, excluding the unknown from the total, was 99·16 against 97·72 in 1891–92, showing an increase of 1·44 per cent. The tri-weekly system of vaccination introduced from the year 1889–90 in the several vaccine depôts compares favourably with that of the previous years when vaccination was carried on daily. Though there was a decrease in the number of operations performed during the year, yet there was an increase in the percentage of success of 1·44. There are eight vaccine depôts where vaccination was carried on tri-weekly and free of charge.

Out of 24,858 cases vaccinated 14,215 were males and 10,643 females, being 980 Europeans, East Indians and Native Christians, 1,651 Mahomedans, 2,223 Hindus, and 4 of other castes.

Out of 24,858 cases 21,421 were primary and 3,437 re-vaccinations. Of the 21,421 primary vaccinations 21,114, or a percentage of 99·57, were successful, against 99·45 in 1891–92. The percentage of success in primary vaccination was naturally higher than in re-vaccinations, though in the latter it was unusually high (96·57).

The accompanying statement will show the number of cases vaccinated during the past three years under different ages. Out of 24,858 cases 13,849 were infants under one year, showing a decrease of 2,054 cases when compared with the previous year, because there was a corresponding decrease of live-births registered from 18,336 in 1891–92 to 16,789 in 1892–93. There were 4,841 cases above one and under six years and 6,168 cases above six years, showing an increase of 159 and 260 respectively over those of 1891–92.

	Total Number Vaccinated.			Ratio.		
	1890–91.	1891–92.	1892–93.	1890–91.	1891–92.	1892–93.
Under one year - - -	15,709	15,903	13,849	63·4	60·0	55·7
Above one and under six years -	5,252	4,682	4,841	21·2	17·7	19·5
Above six years - - -	3,807	5,908	6,168	15·4	22·3	24·8
Total - - -	24,768	26,493	24,858	100·0	100·0	100·0

The number of births registered during the year 1892–93 was 17,249. Of these, 460 were still-born and 16,789 were born alive. There were 4,921 deaths under one year from various causes, exclusive of still-births. If these be deducted from the total births registered, it will be seen that the number of infants operated on exceeds the number of live children. All infants vaccinated were not born in Madras, but some of them were born in the moussil and subsequently brought to Madras. If the number

of children that died under one year, but were vaccinated prior to their death, be taken into account, then the number vaccinated and the live-births would be almost equal.

Out of 13,849 infants vaccinated under one year of age, 10,191 are reported to have been born in Madras and 3,658 cases to have been born beyond the Municipal limits and brought to Madras a few months after delivery, their parents being permanent residents; and it is customary among Hindus for mothers to be sent to their mothers' houses up-country for confinement. There is nothing to show how many infants born in Madras were taken after delivery to their native places before the age of six months.

For every 100 of the population, according to the Census of 1891, 5·49 were vaccinated during the year. The proportion of Hindus is especially large, and 6·19 per cent. of this class resorted to vaccination against 2·46 among Europeans, East Indians, and Native Christians, 3·10 among Mahomedans, and ·67 among other castes.

During the year 21 deaths from small-pox occurred against 24 in the previous year, showing a slight fall in the mortality. Of the 21 deaths, 4 occurred in hospitals and dispensaries and 17 in private houses in the city. The disease was not confined to any particular locality. Two deaths occurred among infants under six months, 6 above six months and under one year, 11 over one and under 12 years, and 2 above 12 years. Immediate steps were always taken in vaccinating the unprotected children in the neighbourhood where deaths from small-pox occurred, and in disinfecting the houses in which the disease appeared. Re-vaccination of adults living in the infected houses was also encouraged. It is pleasing to note that no deaths from small-pox occurred among the fishermen during the year. The parents are now alive to the benefits of vaccination and the enforcement of the Act if they omit to obtain the vaccination of their children at the depôts on receipt of notices. They resort to the depôt to get their unprotected children vaccinated, and the vaccinators have free access to them when they visit their huts, whereas three years ago they could only deal with them with the help of the police, and vaccinate the children at their own huts.

Out of 17 deaths from small-pox that occurred in private houses, 8 were imported cases, and in 9 the disease was contracted from them. As small-pox has a long period of incubation, eruptions appear after arrival in the town among the unprotected people who come up to Madras after contracting the disease in the moussil, and when attempts are made to suppress the disease, fresh cases occur in some other Division. It would be a great safeguard if provision were made in the byelaws for compulsory vaccination of infants under six months and re-vaccination after puberty in the case of persons who are exposed to infection through residence in a house infected with small-pox.

During the year, after a successful trial of some glycerine vaccine prepared by, and obtained from, Dr. Calmette of Saigon in Cochin China, and some experiments by the Inspector of Vaccination, the Health Officer and the Deputy Inspector of Vaccination, the Saigon method of preserving lymph with glycerine was introduced in the Municipality, principally for the supply of the districts where calf-to-arm vaccination is impracticable. The process is as follows:—A calf is inoculated by scarifications of from 2 to 3 inches in length. The pulp is taken and rubbed up with glycerine in a glass mortar, about equal parts being used. The glycerine extract thus obtained is stored in glass tubes of much larger calibre than the capillary tubes, which have previously been sterilised. These tubes are closed with sealing-wax, as it was found that the temperature required to fuze them was apt to destroy the vaccine. The tubes are wrapped up in paper and packed in pieces of hollow cane, and the ends of the cane are closed up, so that the vaccine is fairly protected from light and heat. There is now a large demand for this vaccine from the moussil and it is distributed by post. Good reports of its efficacy have been received from district officers. In trials made in Madras with puncture only, the insertion percentage of success was 100 with vaccine that had been preserved for 10 days. Towards the end of the month it was found to begin to deteriorate, though still fairly successful. As a matter of fact, 10 days is ample for transmission to any part of the Presidency. One advantage of this preparation over lanoline paste is that it does not require scarification, which the natives strongly object to. From July 1892 to March 1893, 225 tubes were sent to different parts of India, Burma, and Ceylon. Each tube contains sufficient for 50 insertions.

Vital statistics.

Births.—The births registered during the year 1892 numbered 16,659, exclusive of still-births, being 1,402 fewer than the year before, which was exceptionally high, and were in the proportion of 36·8 to 1,000 persons living. The decrease may be

attributed to the high price of food and the prevalence of epidemic disease in 1891, both of which seriously affect the health and vigour of the population of reproductive ages. One disturbing influence was the cholera epidemic of 1891, another influenza, which has been found to have a considerable effect upon birth-rates in Europe. Though lower than that of the two preceding years, the birth-rate of 36·8 compares favourably with that of London (1892, 30·8), and is fully double the registered rates of Calcutta and Bombay. The number of still-births was 405 against 489 in the preceding year, being 2·37 still-births to 100 survivals. Of these 224 were males and 181 females, the proportion being 123 to 100. The proportion of still-births to survivals shown in the Reports of the Government Lying-in Hospital for 10 years was 9·5 to 100. Making allowances for cases brought to the hospital, either grossly neglected or maltreated, with scarcely a chance of recovery, and taking it into account that the midwifery practice and general conditions outside are, for the most part, as bad as those inside are good, one is forced to the conclusion that the number of still-births actually occurring must be at least treble the number registered, and that the corpses of a large number are probably disposed of in any convenient piece of ground.

The Hindus were as usual the most prolific race, their birth ratio being 37·1; the Mahomedans come second with 35·8, and the Christians third with 35·5. The number of males born alive to every 100 females was 105·3. It is noticeable that among the Christians there was a slight excess of female over male births.

Mortality.—The deaths registered during the year numbered 20,847 against 23,808 in 1891, being in the proportion of 46 per 1,000 against 52·6 in 1891, the mean of the decade being 37·4. The comparative death-rates of the different castes were Hindus 47·2, Mahomedans 45·1, Christians 36·7, and others 13·4. Although the death-rate for the year under review is lower than that of the previous year under every class except fevers, and in every division except the second, nevertheless it is still exceptionally high. Prolonged want, due to the continued high price of food, was the principal predisposing cause of the high mortality among the masses, apart from the general insanitary condition of their surroundings, which was certainly not worse than usual. The principal foods of the poor in Madras are rice and ragi. Of the former on an average 9·2 seers were sold per rupee against 10·5 in 1891, and a normal of 13·8, the purchasing power of the rupee being equivalent to about as. 10, pies 8 in an ordinary year, and the price of labour remaining unchanged.

Mortality from different Diseases.—A comparison of the relative mortality from different diseases in 1891 and 1892 shows that the deaths registered under small-pox, dysentery and diarrhœa, cholera, and other causes were fewer in the year under review, and those under measles and fevers were more numerous. At the same time they were above the decennial average under every head except small-pox.

Statement of Mortality from the Prevalent Diseases in 1892 *contrasted with that of* 1891.

Years.	Small-pox.	Measles.	Fevers.	Dysentery and Diarrhœa.	Cholera.	Total.	Other Causes.	General Total.	Ratio per 1,000.
1891 - -	66	372	6,731	4,573	1,916	13,658	10,150	23,808	52·6
1892 - -	27	374	6,889	3,958	651	11,859	8,988	20,847	46·0
Average of 10 previous years.	664·1	284·6	4,133·0	2,811·0	592·6	8,485·3	8,466·4	16,951·7	37·4

Small-pox.—The total deaths from small-pox numbered 27, or 0·05 per 1,000 of the population, against 66, or 0·1 in the preceding year. A considerable proportion of the cases were among non-residents who came to Madras during the incubation period, as shown under the heading "Vaccination."

Cholera.—During nearly the whole year sporadic cases occurred in different parts of the city, but only twice, namely in May and August, did the disease assume epidemic proportions. The outbreak of 1891 continued during the early part of 1892 till about the middle of February, when it almost entirely disappeared. On April 24th 0·69″ of rain fell, the first rainfall in the year except two very light showers in January, and on the 27th 14 cases of cholera were reported, of which 8 proved fatal. The first cases occurred in the 7th Division. The town smelt very badly the morning after the

rain, which was just sufficient to soak the dry filth, and it may be to reanimate the cholera germs, which had remained quiescent during the drought since the previous outbreak, and arouse them to a state of activity. It may also be that the rain sinking into the ground displaced a certain amount of the ground air which ascended into the houses laden with moisture as a disease-bearing myasma. This outbreak reached its height in the first week in May, when 142 deaths from cholera were registered. During the last week of April the Mahomedans were feasting after their long fast during the Ramzan, and a considerable number of Hindus went to a feast at Conjeeveram. No actual connexion was traced between the Conjeeveram feast and the Madras outbreak, though cases of cholera were occurring at the time all over the Conjeeveram taluq. Apart from the question of the carriage of infection these festivals appear to predispose the persons attending them to attacks of cholera.

The disease continued in a sporadic form till the beginning of August, when the Mahomedans kept the Mohurrum in Madras, and a large number of low caste Hindus went to the Periapalliam festival. Then it increased to epidemic proportions, though not to such an extent as in the preceding year, though the dates of the increase closely coincide. This increase was apparently unconnected with the rainfall as showers fell every week during June, July, August, and September, keeping the ground constantly moist and cool. The outbreak reached its maximum in the week ending 2nd September, when 43 deaths were registered. After this the disease subsided, and only 22 deaths were registered during the last quarter of the year.

The total number of deaths from cholera was 611 against 1,916 in the preceding year, the rates being 1·3 and 4·2 per 1,000. Of these 327 were males and 284 females, being 115 males to every 100 females. The excess of male over female deaths is unusual and difficult of explanation. It occurred principally in the 2nd Division, in which 86 men died to 28 women.

During the year 1892 there was less cholera in the districts around Madras than in the previous year, and the outbreaks in different parts of the city could not be traced to importation. It appeared rather as if the disease were in the town though not very active. Sporadic cases occurred quite irregularly and, as a rule, showed no tendency to cause epidemic centres. The two small epidemic outbreaks appeared to be due to the meteorological and other conditions being especially favourable. It would be a great assistance in dealing with cholera if notification were made compulsory on all persons under a penalty. Though it is believed that considerable vigilance was shown by the Sanitary Overseers and special Overseers on cholera duty, somewhat less than 500 cases were reported. The relatives are quite capable of diagnosing the disease, but they are apt to conceal its existence in order to avoid the nuisance of having their houses disinfected, which is hardly to be wondered at when they believe that the sacrifice of a sheep or hen will be more efficacious. Public opinion on that point has, however, made some advance, for most of the people are anxious for their neighbours' houses to be disinfected when cases occur in them. It is, in many cases, through the anxiety of the neighbours that the existence of disease in a house is ascertained. Section 368 of the Municipal Act is of very little use, as it only requires medical practitioners to give information, and probably not more than 5 per cent. of the cases are seen by them. Moreover, there is no penalty for non-compliance. It would also be of great assistance if the hospital authorities would pass orders that the name and full address of every cholera patient admitted should be taken and communicated to the Health Department for the disinfection of the house.

Measles.—The deaths registered under measles numbered 374, against 372 in the preceding year. This disease has been very prevalent ever since the severe epidemic of 1889.

Fevers.—The deaths from fevers numbered 6,889, or 15·2 per thousand. This number is the highest recorded in Madras and is 2,556 above the average. The enormity of the ratio will be apparent when compared with the fever rate in England which is about 0·2. Though doubtless a fair number of cases of a non-malarial type were registered under this head, there can be little doubt that most of these deaths were due to fever of a malarial type, due to the polluted state of the ground and the inadequacy of the drainage of the town, insufficiency of food and clothing, over-crowding of houses and want of ventilation playing a secondary part in bringing about this result. It is noticeable that the ratios of mortality of Hindus and Mahomedans from fever, viz., 15·9 and 14·7, are considerably higher than that of Christians. This is attributed to the fact that a larger proportion of Christians live in healthy parts of the town and are well fed and clothed. The 2nd Division, which has an area of about a mile with 84,385 persons to inhabit it, provides the highest

fever ratio of 20·2 per thousand. The 3rd Division, which is under a mile with 59,457 inhabitants, comes next with a ratio of 19·4. These two Divisions together form Black Town. The third highest fever ratio is in the 1st Division, which includes the Tinnevelly Settlement and other crowded parcherries. *Apropos* of what has been said of late of chill as the cause of Indian fever, it is worthy of note that in Madras the largest number of deaths occurred in August and September, comparatively warm months, and not in the coldest months of January, February, and December.

Bowel complaints.—The deaths from dysentery and diarrhœa numbered 3,958 against 4,573 in the preceding year, giving a ratio of 8·7 against 10·1 per thousand living. The rate varied from 7·5 in the 7th Division and 7·8 in the 2nd and 3rd to 10 and 10·4 in the 5th and 1st Divisions. It is somewhat remarkable that the 7th Division (Chintadripet and Triplicane) should have returned the lowest rate for these diseases for the last two years, as there are worse smells there than in almost any other part of the town.

ABSTRACT OF REPORT OF THE MUNICIPAL COMMISSIONER FOR THE CITY OF BOMBAY FOR 1892-93.

(*Mr. H. A. Acworth.*)

Public works.

DRAINAGE.—*Pumping Station, Love Grove, Worli.*—The four sets of Worthington triple expansion engines, sewage pumps, and Babcock boilers, for which, as reported last year, a contract had been entered into with Messrs. Simpson & Co., of London, were all delivered in Bombay by the 8th December 1892. The whole of this machinery was examined and passed in England by Major Tulloch, R.E., of the Local Government Board, on behalf of the municipality. The original intention of utilizing the existing engine and boiler house for the new engines was found to be impracticable, and an additional grant of Rs. 40,000 was sanctioned for the construction of a new engine and boiler house. The contract for this work was given to Messrs. Sittaram and Bibra, and on the 31st of May, 1893, the work was practically finished. To the same contractors was given the work of the brickwork bedding, above 78·50 T.H.D., for the new engines and pumps. The contract for the erection of the machinery was given to Mr. C. Briggs, and the time was five months from the 6th March 1893. The work was in progress at the end of the year.

The old engines and pumps have been kept going with such repairs as were from time to time indispensable. Owing to the large accumulations of silt in the sumps, there were two or three breakdowns, necessitating temporary stoppages. It was found impossible to keep the sewage down to the level of three feet, owing to the advent of the Tansa water, and to the decreasing efficiency of the engines. Mr. G. F. Horbury regularly inspected the station during the year and advised regarding the repairs necessary to keep the engines and pumps going until the new engines, &c., could be started. The coal has been purchased, as during last year, direct from the importers, and this arrangement has proved satisfactory. The excess quantity of coal consumed is due to the increasing inefficiency of the old engines, and to the centrifugals being kept working to cope with the largely increased quantity of sewage. A chawl of 17 rooms for the firemen, &c., has been erected, and quarters for the superintending engineer and second engineer were approaching completion at the close of the year.

House Connections in First Drainage Section.—As reported last year, this work was being proceeded with departmentally, and it was being pushed on vigorously, when the Corporation appointed a committee to inquire into the general question of the suitability of the existing system of connections and the possibility of improvements therein, and desired that, until the report of this committee was submitted, further work should be stopped, and it was stopped accordingly. The number of house connections made is 223, but none of the districts in which the work was being carried on have been entirely completed. Several meetings of the committee have been held, and practical experiments on certain schemes proposed by some of the witnesses are in course of trial.

The ventilation of the Queen's Road sewer has been improved by the erection of two masonry vent-shafts, and eight large manholes have been constructed on various points of the sewer to allow of greater facilities in cleaning it. The work of brick-arching over the old open main drain at the Arthur Road Crossing was put in hand on the 6th January 1893, and the work is now in progress. The work in house connections in the Agripada district is practically completed, there remaining but three houses to be connected and five masonry vent-shafts to be put up. The contract for this work was Rs. 2,05,791, and the value of the work executed is Rs. 2,00,352. Metal vent-shafts in Ripon Road have been erected. The laying of a pipe sewer in Government House Road, Parel, was commenced on the 26th April 1892, and the work was in progress at the end of the year. Pipe sewers and metal vent-shafts for Parel village are also under construction. A storm-water drain in Hornby Road, from opposite the Salvation Army Hall to the storm-water drain in Bazaar Gate Street, was completed.

Several additional latrines and urinals have been erected, while several others are in course of erection. The Night-soil Depot at De Lisle Road was completed and handed over to the Health Department. The Carnac Bunder Nightsoil Depôt has been

maintained in good order. The supply of water from Tansa enabled arrangements to be made to use fresh water for flushing purposes, instead of, as hitherto, sea water; and from the 8th March last, the working of the pumping station at Carnac Bunder has been discontinued. The several drainage sluices were worked satisfactorily, and the work in miscellaneous drainage of repairing, altering, constructing, cleaning, and flushing sewers and drains was well done.

WATERWORKS.—*Tansa.*—The rainfall was 114·18 inches. The lake overflowed on the 11th July 1892 after 27·64 inches of rain had fallen. The lowest level before the monsoon of 1892 was 399·13 T. H. D. on the 16th June 1892. The lip of the lowest outlet is at 380 T. H. D. The overflow level is at 405 T. H. D., and on the 31st March 1893 the level was at 398·91 T. H. D. The average daily quantity drawn off during the year was 20½ millions of gallons. The dam continues in a completely satisfactory condition, and no damage was caused by the overflow which, on the 2nd September 1892, was of a depth of 1·06 feet. The total quantity which passed over to waste is calculated to be 30,000 millions of gallons. The duct from Tansa to Ghat Kopar was taken over from the contractors on 1st February 1893. No accident occurred to it. The 48″ main failed on 8 occasions at different places between Ghat Kopar and Chinchpoogli and caused much inconvenience. The maintenance period of the contractor does not expire till the end of October 1893. The Tansa Works have not given nearly so much trouble and anxiety as might have been expected from the first year's working of such a large undertaking.

Vehar.—The rainfall was 129·38 inches, the heaviest on record since 1861. The average for the 32 years 1861 to 1892, both included, is 83·90 inches. The lake overflowed on the 27th August 1892, and the overflow ceased on the 8th October. The lowest water-level was 249·5 T. H. D. on the 7th June 1892. The storage on the 31st October 1892 was 11,155 millions of gallons.

Tulsi.—The rainfall was 144·15 inches. The lowest water-level was 434·45 T. H. D. on the 7th July 1892. The lake overflowed on the 17th August and continued to do so until the 5th October. The storage on the 31st October 1892 was 2,173 millions of gallons. The loss during the dry season—from 1st November 1892 to 31st March 1893—was 928 millions of gallons. The quantity of water which passed over the waste weir into the Vehar Valley is estimated at about 2,000 millions of gallons. Boundary stones 300 feet apart were fixed on the pipe line from Tulsi Lake to Mahaluxmi. The pipe line embankment between Mahim and Bandora was repaired, and the repairs to the embankment between Haines Road and Mahim are in progress.

Pawai.—The rainfall was 122·27 inches, and the lake overflowed on the 27th July 1892 and continued to do so until the 19th October. On account of the completion of the Tansa Works, the supply from this lake was not required. The decision of the District Judge regarding the value of the land acquired for the works was upheld on appeal to the High Court.

Bhundarwada (John Hay Grant) Reservoir.—The repairs have been continued during the year, the work done being the covering of the floor of the distributing basin with Indian patent stone 1″ thick, and the plastering of the piers up to a height of 5′ 6″. The result has been that for depths of 13 feet and under the basin is in good condition. The distributing basin being under repairs, the filters could not be used, and Vehar water was supplied unfiltered throughout the year. Repairs to a portion of the embankment of the 32″ main between Sion and Kurla were completed on the 25th June 1892.

The offer of rewards for the capture of crocodiles in the lakes and for finding of their eggs was continued, but the claims were only for two crocodiles and 18 eggs. The alleged presence of leeches in the water supplied from the lakes has not been substantiated, and in the cases investigated the evidence pointed to the leeches having come from the drains. No case has yet been proved of their coming from the lakes, nor of their being found inside the service reservoirs or mains.

Distribution and Maintenance.—The total length of new mains laid was 2,971 feet. The number of free supplies, dipping wells, drinking fountains, &c., is 174. The work of closing dipping wells and substituting taps is being proceeded with. The Dharsi Nanji Drinking Fountain in Argyle Road and also a new cattle-trough in the same road were taken over by the municipality. The number of notices issued to owners on account of faulty taps and service pipes was 3,906, against 3,192 in the previous year. Sanction was accorded to sever the connexions of 1,025 service pipes, but in only 199 cases were the connexions severed. There were in all 312 bursts of pipes, of which 174 were of 3″, and 92 of 4″ pipes. Many of the old 3″ and 4″ pipes have become quite unfit for the present high pressure. The 32″ Vehar main failed between

Dadar and Matoonga Stations of the G. I. P. Railway on the 9th September 1892, but it was repaired by the 12th idem. The pipe was corroded from the outside to three-fourths of its thickness, the cause of corrosion being its contact with salt earth. Six hundred and forty-six new connexions were made, and 273 services were disconnected, the net increase being 373, thus bringing the total number of connexions to 18,486. The percentage of increase—2·1—is below that of former years, but it is the strongest testimony that the Tansa supply has effected a vast improvement, inasmuch as the number of complaints and the number of applications for second connections or enlargements are reduced. The meters in use at the end of the year numbered 1,426, or an increase of 107 on the number of the preceding year.

Public health.

The state of the public health during the year under review has been unfavourable. The total number of deaths from all causes amounted to 26,518, equal to a death-rate calculated upon a population of 821,764 (the census of 1891) of 32·26 per 1,000 of population. This is an increase of 2,671 in the number of the previous year. The average number of deaths for the last five years is 23,339, or a death-rate of 27·50. The returns of mortality show an increase in all the death causes, except in that relating to the nervous system, in which there is a slight decrease. The chief increase of mortality has been from small-pox, fevers, phthisis, diseases of the respiratory system, and dysentery.

The sections of highest mortality were Parel, 47·59; Kamathipura, 46·15; 2nd Nagpada, 44·49; Omerkhari, 42·56; Khara Talao, 42·53; Mandvi, 41·61; Chukla, 40·47; Tardeo, 40·62; and 1st Nagpada, 40·15; and the sections of lowest mortality were the Water Division, 2·66; Fort (South) 8·60; Mahalakshmi, 15·34; Worli, 17·29; Walkeshwar, 17·32; Chowpati, 19·11; Esplanade, 19·37; and Sion, 20·56. The death-rate was highest amongst Hindu low castes, Jains, Mahomedans, and Bhatias, being 51·38, 46·42, 41·25, and 39·79 per 1,000 of population respectively. It was lowest amongst Europeans, Eurasians, Parsis, and Jews, being 20·10, 21·24, 23·78, and 26·88 respectively.

Cholera.—The number of deaths from cholera was 169, or five more than in the previous year, but 106 less than the average. The sections of greatest mortality were the Water Division, Mahim, Tardeo, and Fort (South). The highest mortality by class was amongst Jews, and the next highest was amongst Hindus of other caste.

Small-pox.—The deaths from small-pox were 541, or 433 more than last year and 311 more than the average. They occurred chiefly amongst Hindu low-castes, Native Christians, and Hindus of castes other than Jains, Brahmins, Lingaets, and Bhatias. The mortality was highest in three of the suburbs, Parel, Sewri, and Mahalakshmi.

Measles.—There were 710 deaths from measles, or 96 more than in the previous year; 598, or 84·22 per cent., occurred in the first three years of life. The highest mortality occurred amongst Jews and Hindu low-castes. The death-rate was highest in the districts of Dongri, 1st Nagpada, and Mandvi. In Upper Coloba, Fort (South), and Sewri there were no deaths.

Fever.—The enhanced mortality is principally due to the increased number of deaths from fever. There were 7,751 deaths from fever, or 914 more than last year, and 1,182 more than the average. The death-rate was highest in the districts of Sewri, Parel, and Mandvi. The greatest mortality (excluding the small population, 146, of Negro-Africans) was amongst Hindu low-castes, Jains, and Bhatias.

Leprosy.—There were 45 deaths from leprosy, or 61 less than last year, and 25 less than the average.

The number of births registered (exclusive of still-born) was 15,485, or 33 less than last year. Of these, 8,045 were males and 7,440 females. Excluding Negro-Africans, the birth-rate was highest amongst Hindu low-castes, Jews, and Parsis, and lowest amongst Brahmins and Buddhists. The sections giving the highest birth-rates were 1st Nagpada, Tardeo, Parel, and Sion.

Conservancy.—On an average 4,272 men and women and 1,046 scavenging and drain carts, and 203 night-soil and cess-pool carts were at work each day. The collection of garbage or cutchra was greater than in the previous year by 21 tons a day; 318,194 tons of garbage, equal to 871 tons a day, were collected and removed and disposed of, against 310,362 tons in 1891; 140,480 tons of night-soil, equal to 384·8 tons a day, were collected and removed, against 142,564 tons in 1891; 182·8 miles of covered drains were opened and cleaned, against 191 in the previous year. There were 2,267 bullocks owned by the municipality, and of these 132 died and 61 were cast and sent to Pinjrapole. Of the five horses, one was cast and sent to Pinjrapole.

ABSTRACT OF REPORT OF THE HEALTH OFFICER OF BOMBAY FOR 1892.

(Dr. T. S. Weir.)

The unfavourable state of the public health which had been anticipated from the beginning of the year has been observed, and has now to be recorded. The abnormal seasonal conditions of the previous year, which had been accompanied by a high fatality, have been followed by an even more unfavourable state of the public health and a higher mortality. In the second quarterly report of 1891 I apprehended that cases of small-pox would be prevalent during the cold season of 1892, and that a high mortality would be observed.

It has been observed in the sanitary history of this city that whenever the season may be abnormal, it is followed by a disturbance and unwholesome state of the public health. The readings of the thermometer and the dew point up to May were higher than in 1891, and the range of the barometer all throughout the year was lower. It was observed that in 1892, with a higher temperature and a higher dew point, there was a higher mortality.

The following note from a paper by Mr. Hutchinson on the Meteorology of the Bombay Presidency in 1891–92 will be of interest:—"The year 1891 has, as was "anticipated in last year's sketch, been a year of barometric maximum, and has "consequently been marked by an unseasonable distribution of rainfall throughout "the greater part of the Bombay Presidency. The year 1891 was in some respects "similar to 1877, and although it was not a year of intense famine, it will be "remembered as a year of severe drought in the future meteorological history of "India. From a scientific as well as from a practical point of view, the year "presented several features of importance, such as a high barometer in June, a "relatively low barometer in July, and an unusually late commencement of the "monsoon rains on the West Coast of India."

The effects of these abnormal conditions of season have been observed and have had to be contended against, but the effects of other abnormal conditions within the city and arising out of the city life—the most fatal of all, wetness of ground and pollution —have had also to be combated with. We have had to contend with conditions of season unfavourable to public health and influencing the mortality as well as with other conditions within the city depressing the vitality of the population. The condition most serious of all is soil flooding and hence wetness of the ground from more water having been brought into the city than has been taken out of it.

There has been an enormous increase of the water-supply since 1892—from some 16½ million gallons to about 29 million gallons or more daily—and very little increase in the number of drains. The island is flooded and irrigated with water, and unless drains are constructed to take away the water that comes into the city, the life of a healthy population will not be possible; what has been seen in countries of marsh and wet—the poisoning of life from malarial fevers—will be seen here. It is not possible to look to the future except with anxiety. There has been, with incomplete drainage, an enormous quantity of water—some five or more million gallons of water daily—which the pumping power has been unable to remove, a floating balance indicating danger; and there must be still, even with perfect pumping power, an enormous quantity of water which will not flow away and will not be carried to the drains, because in more than half the island there are no drains. I hope much in the future from the new and powerful pumps, and the increased pumping power which, it is believed, they will give, but drains must be constructed to carry the water to the tributaries of the pumps. However powerful the pumps may be, there must be drains in the districts which have no drains if the pumps are to remove the water and the drainage from the districts. The first principle of the preservation of public health is, that the water coming into the city should be taken away and not left in the soil, and this first principle has been neglected in Bombay. Even the water currents round the island have been obstructed by the causeways and embankments at Bandora and Coorla. The estuary between Bombay, Bandora, and Coorla is filling up. The

most offensive trades—the tanneries—discharge into this estuary, and the water at low tide is fœtid.

During this year I have had to draw attention, not only to stagnation in sewage ways, but to the flowing back of the sewage. This was due to the pumping power not being able to remove all the water that flowed into the sewers. The completion of the system of drainage should be considered in all earnestness. For many years the improvement of the channels which carried rain water and sewage in the long inhabited portions of the island was deferred till a system of drainage had been approved. And for many years a system of drainage has been approved, but neither has that system been completed nor have the open channels been improved; and unless in the years to come drains are constructed more rapidly than in the past, few of the present generation will live to see this system of drainage completed. I take, for instance, Nagpada. Since 1881 I have been describing the imperfect state of the drainage of that crowded locality. Since 1875 the drainage of Nagpada has been under consideration, but unfortunately the consideration of the matter has done no good to the people. Reports do not do the work which drains do. Here is a reference in a not very old report on the drainage of Nagpada:—"I would now draw attention "to a most offensive and loathsome drain which you inspected with me. The new "Nagpada drain runs under two or three houses in Bellasis Junction Road. It was "cleaned as far as these houses; but, fearing to injure their walls and foundations, "the work had to cease near them, but was resumed in the road. This drain was "found to be in a most filthy state; it has been well described as one of the worst "drains, in point of construction, in the whole city." What has been done in the Nagpadas in the last 20 years? Nothing. The drains are getting worse, and our efforts to clean them only make them worse. Where there are trenches unmade, for rain waters into which drainage flows, each cleaning makes them deeper, and the construction of new drains or the repair of old drains has been put off until a general drainage scheme may be sanctioned and until it has been brought into the Nagpadas. In the last Annual Report I wrote:—"In 2nd Nagpada, where we have the greatest "house-crowding, as many as 67·18 persons collected in (15 families to each house) "each crowded dwelling, we have a mortality from phthisis more than twice the "mortality in Byculla, nearly twice the mortality in Parel, and more than twice the "average mortality in all the other sections of the city, and a fatality from diseases "of the respiratory system twice the fatality in the whole city. In 2nd Nagpada the "pressure of population is greater than in the most crowded and dense section of "London."

There are districts which have no drains on which over 60 gallons of water to each inhabitant are poured. The result is pollution and unwholesomeness. Districts, such as Malabar Hill and Worli, which have natural drainage, may be saved for some time; but there will surely be a time when the population in each district will not be able to live in health. The population in the old undrained districts may be said to be living on damp ground. The population in the new undrained districts may be said to be living in pools of sewage. We see in every part of the island, where drains have not been constructed, damp ground or pools of sewage. If more water is taken into the city than is taken out of it the result must be so. In chawls occupied by classes who wash their clothes inside the chawls near water pipes, the ground and floors near the water pipes are splashed and wet. Looking at the wetness inside these chawls, I am doubtful as to the wisdom of allowing water pipes inside the dwellings of the poor. Not only are there water pipes on the ground floors of chawls, but there are water pipes on each floor, around which there is constant washing of persons and clothes.

To save the population from being poisoned by damp, in my opinion the water-supply in the ill-drained districts should be reduced to 20 gallons per head, and to 15 gallons per head in the undrained districts.

Next to drainage the most important improvement needed is in the law bearing on building. After bad drainage the condition most affecting the public health is bad dwelling. The responsibility, however, is not with municipal officers, but with those who framed the municipal law. The state is very lamentable; it is this. On any ground on which a dwelling has been—a building without open space by which inner rooms can have openings to the open air can be built. I have been demanding, in my reports on applications for permission to build, open space for light and air, and I have been advised that my demands are not lawful, and I have had to abandon them, because they were useless and unlawful. If the law was enacted to protect the land-lords, it has been contrived to injure the tenants, and the tenants are many. The

enormous immigration of labouring classes to the city makes their protection from the effects of over-crowding in dark and unwholesome buildings a duty of the highest public importance. In the drained districts there are dwellings on damp ground; in the undrained districts there are dwellings on sewage. Here is what has been proposed and done in Kamathipura in one street—four chawls under one roof and no side gully, the inner rooms having no communication with external air, and it could not be prevented.

Return showing the Number of Deaths from Different Causes in 1892.

Causes of Death.	Number of Deaths.	Rate per 1,000 of Population.	Remarks.
Small pox	541	·66	
Measles	710	·86	
Fever	7,751	9·43	
Cholera	169	·21	
Phthisis	3,538	4·30	
Diseases of the Nervous System	2,330	2·83	
„ „ Respiratory System	4,601	5·60	
Diarrhœa	1,172	1·43	
Dysentery	651	·79	
Accidents	392	·48	
All other causes, except Still-born	4,663	5·67	
Total	26,518	32·26	

Analysing the mortality from the chief death causes, the results are observed to be —an increase in the death-rate from fevers, small-pox, phthisis, diseases of the respiratory system, dysentery, diarrhœa, measles, and accidental deaths. The chief increase of mortality has been from small-pox, fevers, phthisis, diseases of the respiratory system, and dysentery.

At a period when measles and catarrhal affections are prevalent, a high mortality of children is to be expected. A high female mortality during child-bearing periods indicates conditions likely to be unfavourable to infant-life, and we observe that the female mortality during the nubile period has been again this year more than double the male mortality, and that the female mortality is lowest amongst the females who go out most into the open air and live in the most open dwellings—Europeans and Parsees—and highest amongst the females who go out least—Mussalman and secluded Hindus. This is as would be expected.

The highest mortality has occurred in Parel (47·59), which was the section in which the second highest mortality occurred in the last year. At Lalwady, Parel, there are frightful nuisances almost opposite a market, and the entrance to the gas works. The sewage is overflowing into the Dinshaw Petit Mill Tank. All these new houses—a group of "chawls"—have pipes down the sides, and these pipes, instead of doing good, are increasing the danger.

The condition of the group of chawls I now refer to from want of drains is fearfully dangerous. The Health Department took proceedings on account of the nuisances from want of drainage, but the magistrate decided that the department of the engineer should take action, and not the Health Department. I have in my former annual report and quarterly reports described the fearful conditions from water and sewage in pools. Of these, I need only refer to a nuisance around chawls alongside of a public road, and I earnestly hope that this nuisance may be removed within a short time.

Although the mortality in Kamathipura is high (46·15), it is not the highest, as in the last year. There are two improvements which should be carried out in Kamathipura—the drainage of the subsoil, which is almost up to the surface even in the hot season, and the improvement of buildings. A member of the corporation who has come to live in the Old Kamathipura district has seen to his amazement the water rising up through the floor of his house. I told him that it would be so, and even worse, before the rains were over. Kamathipura is now one of the densely populated localities. The section of third highest mortality (44·49) is 2nd Nagpada. In the beginning of the last year I drew special attention to this locality in a report, but nothing has been done since, and I am afraid nothing will be done, except what has been done during the last 20 years—the preparation of estimates. Works for improving

the district were postponed years ago, until the general drainage scheme had been approved.

The four next sections of highest mortality are densely populated localities and localities imperfect in drainage. These sections are Oomarkhari (42·56), Khara Taloa (42·53), Mandvi (41·61), and Chuckla (40·47). All four sections have an old system of underground drains—imperfect, and leaking, and polluting the soil—many of them mere rain-water tracks or channels covered as the localities became populated. The imperfection in the old drains is greater every year because the scraping away of deposits in them scrapes holes. There are in three of the sections some pipe tributaries of the new system, but connections have not yet been made between houses and these tributaries, and therefore the pipes have not been of any use. The improvements needed in these sections are—drainage, ventilation, and improvement of buildings. The drainage of them is very urgent, and the improvement of the municipal law of building is also urgent.

Measles.—With an increased mortality from small-pox, there has been a greater number of deaths from measles, and also, as was expected, a high mortality from diseases of the respiratory system. The prevalence of catarrhal affections, which was observed in the previous year, continued during the early part of 1892.

Small-pox.—Small-pox was epidemic during this year, and the highest mortality in any year from small-pox since 1883 occurred in 1892; 541 deaths from small-pox were registered, being 433 more than in the last year, and 311 more than the average. There has, therefore, been a considerable increase in mortality. I anticipated, in the Second Quarterly Report of 1891, that small-pox would be prevalent during the cold season of 1892. The greatest number of deaths occurred in March, April, February, May, and January.

Fevers.—The mortality from fevers is the principal cause of the enhanced mortality. The total number of deaths from fevers is 914 more than in 1891, and 1,182 more than the average. The causes which have influenced the mortality from fevers I have discussed in the previous portion of the report and in many former reports. Beyond the conditions of season, which have to be calculated for, the chief causes are—imperfect drainage and excessive water and imperfect house ventilation, or, in other words, impurities of soil and air. The first fundamental principle regarding the public health is that the water coming into the city should be taken out of it, and this first principle cannot be applied in Bombay until the Island has been drained. In some of the open drain tributaries, as in Foras Road and Ripon Road, the sewage we have seen flowing back. I have had to draw attention, not only to stagnation in sewage ways, but to the reflux of sewage. This is due to the pumping power not being equal to remove all the water which flows into the sewers.

The apprehensions I felt when the Tansa water was introduced into Bombay have not been unfounded. In the first Quarterly Report of 1892 I wrote as follows:—

"I look with some apprehension to the future from the introduction of Tansa water. It must be remembered that a little more than half the Island has no drains, that all the refuse of the city is deposited in a depression midway in the Island under conditions which cannot now be considered safe."

The future can only be looked to with great apprehension when it is considered that there has been since 1892 an enormous increase in the water-supply—from some 16½ million gallons to 29 million gallons or more daily—and very little increase in the number of drains to carry this water away, and that it must be years before many new drains are constructed. There has been an enormous quantity of water which the pumping power has been unable to remove—some millions of gallons which may be considered a floating balance indicating danger. I hope much in the future from the increased pumping power which has been erected. If the pumping power is not equal to all that is expected, disastrous effects on the public health may be expected. But, however good the system of pumps may be, drains must be constructed to carry the water delivered into the city to the tributaries of the pumps, and however powerful the pumping power may be, there must be drains in the districts which have no drains if that power is to be of full effect.

Examining the mortality from fevers, it will be observed that 6,284 are referred to remittent fever, being 757 more than in the last year, and 1,155 more than the average; 1,071 are ascribed to simple continued fever, being 161 more than in the last year and 43 less than the average; 377 are referred to ague, being 5 less than in the last year and 69 more than the average; 19 are ascribed to enteric fever, being 1 more than in the last year and 1 more than the average.

The mortality by districts is suggestive. The highest mortality has occurred in two districts of the suburbs in which the mortality ought to be low. These two districts are Sewri (20·45) and Parel (16·49). In the last year the highest mortality occurred also in Parel and Sewri (15·13 and 14·34 respectively). In both districts there are the same conditions, increasing population and want of drains in Sewri and Parel. A sewer has been constructed in a portion of the Parel district. The dwellings on either side of this sewer, in a very populous portion opposite a market, rest in sewage, and where the sewage accumulates and where people wade through it, a channel has been cut, through which sewage trickles into a mill tank. This is a melancholy and filthy state to surround crowded dwellings. I have in the annual report for 1890 referred to the drainage of Parel. As yet there has been little improvement; the condition is nearly as bad now as then, for there is the old foulness and the new foulness that has come with the new buildings. In Mandvi, the section of the third highest mortality (14·64), the connexions to such portions of the new system of sewers as have been constructed ought to be made. Mandvi, Khara Talao, and Chuckla are sections in which there is little space for ventilation, and densely crowded houses with high piling.

The highest fever mortality occurred again this year amongst the small community of Negro-Africans (130·13). Looking at the exceptionally high birth-rate amongst Negro-Africans there must be an increase in their population. Examining the total mortality, it will be observed that the chief increase has occurred amongst Hindu Low Caste, having risen from 14·85 in 1891 to 19·77 in 1892. The increased mortality in the mass of the Hindu population is equal to 8·66. In last year's annual report I suggested that the high mortality in that year amongst Lingaets was influenced by fluctuation of population, and in 1892 we observe that the mortality of Lingaets (14·03) is less than 1891. It is suggestive that while the total mortality amongst all classes from fevers is higher, the mortality from fevers amongst the Mussalman community is nearly the same (8·74) and amongst the Parsi population (6·38) is lower. The mortality amongst Jews (3·78) is also less, and amongst Eurasians (2·74) it is the same as in 1891, whereas amongst Europeans the mortality (3·36) is higher.

Cholera.—From cholera 169 deaths were registered, being 5 deaths more than in the last year, and 106 less than the average; 219 cases were reported, of which 169 ended fatally, giving a mortality of 77·16 to 100 cases.

The greatest number of cases occurred in August, September, October, and July—in fact, in the four months of the rainy season, when water in the soil is highest and the ground on which so much of the population sleeps is wettest.

As in previous years, most cases occurred in the population born outside of Bombay, and the mortality in these cases is higher than amongst cases in the Bombay-born people; 183 of the 219 total cases were born outside of Bombay :—

Birth place.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Bombay - - -	30	23	76·6
Elsewhere - - -	183	141	77·0
Unknown - - -	6	5	83·3

If the cases are grouped according to periods of residence, it is observed that 45 of the cases were under three months and 21 under six months :—

Duration of Residence in Bombay.	Attacks.	Deaths.
Under 3 months - - -	45	37
Under 6 months - - -	21	20

The mortality, according to the source of water supply, is interesting. It will be observed that nearly the same number of cases as in the previous year used well water and that nearly the same number died, the proportion of deaths to cases in each year being nearly 94 per cent. In 1891, 16 people using well water suffered from cholera, and 15 died, while in 1892 it will be observed that 15 used well water, and 14 died.

For 1892.	Attacks.	Deaths.	Percentage of Deaths to Attacks.
Vehar, Tulsi, and Tansa water consumers.	172	129	75·0
Well-water drinkers - -	15	14	93·3
Unknown - - -	32	26	81·2

The incidence of mortality by districts, although it cannot be said that cholera was epidemic at any one period or in any one locality during the year, is interesting, for it will be observed that in Girgaum the mortality (0·33) is less than in the last year, and that in Fanaswadi (0·20), where cholera was formerly in almost every year epidemic, only 5 deaths occurred. The low mortality in these two districts is the result of improvement in dwelling and in drainage. The highest mortality occurred in the Water Division (0·72), and in the undrained and damp district of Mahim (0·70). This district needs improvement. It needs drainage to carry away water, and it needs roads for ventilation.

Phthisis.—There is a very great increase in the mortality from phthisis, which is 406 more than the last year and 720 more than the average. The mortality is equal to 4·30 against 3·81 in 1891. The increase in this year over 1891 is nearly the same as the increase in 1891 over 1890. This increase is most serious, and I have been pointing out the causes which must be attributed to it. These causes are imperfect drainage and imperfect house ventilation. The locality in which the mortality is highest is Chuckla (9·47), and Chuckla was the locality of second highest mortality in 1891.

Digestive System.—To diseases of the digestive system 2,428 deaths were ascribed, being 371 more than in the last year and 266 more than the average. Of the deaths from diseases of the digestive system, 1,172 were ascribed to diarrhœa, being 143 more than in the last year, and 150 more than the average, and 651 were referred to dysentery, being 179 more than in the last year and 74 more than the average. To all other diseases of the digestive system 605 deaths were ascribed, being 49 more than in the last year and 42 more than the average.

Respiratory Diseases.—To diseases of the respiratory system 4,601 deaths were ascribed, being 222 more than in the last year and 670 more than the average. Of the deaths referred to diseases of the respiratory system, 2,919 were ascribed to bronchitis, being 114 more than in the last year and 470 more than the average, and 1,037 were referred to pneumonia, being 74 more than in the last year and 180 more than the average.

Nervous System.—From diseases of the nervous system 2,330 deaths were registered, being 117 less than in the last year and 240 more than the average.

Births.—The number of births is very nearly the same as in the last year, there being only a difference of 33; 15,485 living and 1,427 still-born births were registered. Of the living births 8,045 were males and 7,440 females. The proportion of males to females by the Census of 1891 was 170·60; but assuming that there were 100 males to 100 females, the birth-rate would be equal to 32·14 per 1,000.

APPENDIX.

No. 1.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER with the GOVERNMENT OF INDIA for 1892.

1. *Sickness and Mortality in the European Army of India.*—The statistics of all sections of the community—the army, both European and Native, the prisoners, and the general population—are so fully discussed in this Report that we shall, in order to avoid repetition, deal with figures as little as possible, and endeavour to confine what remarks we have to make, on the one hand, to the great facts of the year as compared with those of other years, and on the other to the conditions, both general and local, which are associated with them. To begin with the European troops which garrison India, we learn that, as regards both the sick and death rates, their sanitary history as a whole was by no means so favourable as that of former periods. For the purposes of comparison the averages of three different ten years are given, viz., from 1870–79, from 1881–90, and from 1882–91. In order to make the periods correspond with the times of the censuses the year 1880 has been left out. It will be observed, also, that the two last decennial groups overlap one another. According to the foot note to the opening abstract in paragraph 2, the reason for this would seem to be that the statistics from 1881–90 include the men in Afghanistan during 1881, and thereby include an element which might render the comparison faulty. As a matter of fact, the results of the two periods 1881–90 and 1882–91, are almost identical, but as the years included are not the same in both it may still be true that the statistics of the army in Afghanistan did introduce a very disturbing element which has been neutralized by the events of other years. We doubt very much the advantage to be derived from the construction of the averages over a series of years, except in a very simple form. The most valuable facts are apt to be lost sight of in them altogether. A period of ten years may, and judging by past experience certainly will, include several that were most unhealthy and others that were distinguished by an unusually small amount of sickness and mortality, but the average of the whole period will not tell us, or, in fact, give the smallest clue to the nature of the items of which the averages are composed. We should much prefer to have a few simple statistics of each individual year to the most elaborate statements regarding ten-year periods taken as a whole. But, looking at the figures as they are given, we learn that in 1892 the European troops throughout India suffered from sickness more than the average. The admission-rate (1,517) and constant sick-rate (84) were considerably higher than in 1891 or than the average of the ten-year periods with which they are compared, and the death-rate (17·07) was also the highest excepting that of the ten years (1870–79), when it averaged 18·34. The invaliding rate (24) was low. Considering the very unhealthy character of the year and the great sickness and mortality which prevailed over most parts of India, the results in the European army are more favourable than were to be expected.

2. *Comparison of Presidencies.*—In the European army of Bengal during 1892 the statistics of sickness and deaths closely resemble those already given for the European army of India as a whole Sickness was very prevalent. Both admissions into hospital (1,582 per 1,000) and the daily number constantly sick (87) were in a high ratio, and the mortality (19·81) was greater than that of former terms, with the exception of the average of the ten years 1870—79. In Madras the death-rate was much lower (12·32), and the admission-rate (1,236) was also lower than in the previous year, but the constant sick-rate (83) was higher. In the Bombay Presidency the admission-rate (1,593) was slightly in excess of that for Bengal, but the constant sick-rate (74) was considerably less than that of either of the other Presidencies, and the death-rate (12·90) was but slightly in excess of that of Madras. If, therefore, we compare the three Presidencies as respects admissions into hospital they stand thus: Bombay, 1,593, Bengal, 1,582, and Madras, 1,236; as regards the constantly sick, Bengal, 87, Madras. 83, and Bombay, 74; and as regards mortality, Bengal, 19·81, Bombay, 12·90, and Madras 12·32.

3. *Statistics of the Ten-year Periods* 1860–69 *and* 1870–79.—In illustration of what we have said of the value of the statistics of single years as compared with the averages deduced from a series of years, it is of interest to note the annual items of which the averages for the ten-year periods quoted on this Report are composed. In the army of India, as a whole, the first such period available is for the ten years 1870–79 and for this period the average admission-rate is 1,474·8, but taking the individual years, as shown in Dr. Bryden's volume for that time, we find that the annual rate varied from 1,257·3 to 1,871·2. In the same way the constant sick-rate, which averaged 60 for the ten years, varied between 55 and 75 per 1,000, and the mortality, which averaged 19·34 fluctuated between

12·71 and 34·55. The mortality of one of the years was nearly three times that of another. The statistics of the earlier decade 1860–69 are available for the Bengal Presidency only, and here we have further illustrations of the imperfect, and indeed altogether erroneous, impressions which averages are apt to convey. For this period the constant sick-rate for European troops in Bengal averaged 67, but the range between one year and another of the series was from 52 to 83. The average admission-rate (1,754) fluctuated between 1,412 and 2,051, and the death-rate, which averaged 29·98 is composed of annual ratios ranging between 20·11 and 45,93. Similar examples might be given from the experience of the other two Presidencies, but enough has been said to show how important it is, for the right understanding of Indian health statistics, that the facts regarding individual years should be kept clear and distinct.

4. *Comparison of Groups.*—A sketch map has been added to this Report, in which the boundaries of the several groups are shown, and this greatly facilitates the proper understanding of the statistics regarding them. In Table XVIII. full particulars appear regarding each group—the contant sick in every month, the ratio of admissions from all the chief diseases, and the death-rates also distributed according to causes. The Gangetic Plains afforded the highest sick-rate (104), the Indus Valley and North-West Rajputana the largest admission-rate (2,008), and this group contributed also by far the highest mortality (31·81), the next highest being 22·01 in the Upper Sub-Himalayan group, the Hill convalescent depôts, which compose the last group, being left out of the comparison for obvious reasons. In Decennial Table XVIII. similar information is given regarding each group for the antecedent ten years 1882–91, so that the results of 1892 may be compared with those of the preceding decade. Of the general population during 1892 we have little to add to the remarks made in our memoranda on the Provincial Sanitary Reports, but we may notice here two points of interest. The first is that the distribution of the sickness and mortality among the European troops in 1892 bears testimony to the general accuracy of the facts recorded in the death registration during that year. The people as a rule suffered most in those parts where the exact statistics show that sickness was most prevalent. The other point is that, when the mortality among the people was in nearly all the provinces greatly in excess of that of ordinary years, the loss to the European army was comparatively small, a fact which speaks well for the sanitary care which is taken of them.

5. *Comparison of Stations.*—Statement No. XIX. is the first of the valuable series annually devoted to the statistics of stations. It deals separately with 117 distinct places in addition to troops marching, and is followed by others numbered XX. to XXVIII. which show the extent and nature of the sickness in each place and the mortality which it occasioned. In Statement No. XXXII. there is a still more complete return of the causes of admissions into hospital and of deaths in and out of hospital in 145 separate places in the three Presidencies, every detachment, however small, being shown separately. Omitting very small bodies of men and convalescent depôts the maximum daily sick-rate was at Myingyan (154), and the lowest (27) at Port Blair. The highest admission-rate (2,524) was at Delhi, and the lowest (719) at Port Blair. The greatest mortality was 69·65 at Myingyan; at several places there were no deaths. In quoting these figures we have taken no account of places where the garrison was under 100 in strength, and which were occupied for only a small portion of the year. We shall revert again to the statistics of stations in connection with the account given of their sanitary or insanitary condition, but before coming to this important part of the Report we must first glance at the general history of some of the more prominent diseases.

6. *History of more prominent Diseases. Influenza.*—The following tabular statement continues the history of the influenza epidemic among troops and prisoners during 1892:—

Influenza among Troops and Prisoners.

—	Strength.	Monthly Number of Admissions into Hospital.												Ratio per 1,000
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
European Troops:														
Bengal	42,198	49	26	255	208	47	2	28	8	—	—	—	—	14·8
Madras	13,227	—	16	98	33	10	2	4	—	—	—	—	—	12·3
Bombay	12,712	64	11	1	—	—	—	—	—	—	—	—	—	6·0
Native Troops:														
Bengal	65,594	388	203	374	128	16	3	—	—	—	—	—	—	17·0
Madras	25,963	1	8	67	10	—	—	—	7	—	—	—	—	3·6
Bombay	23,355	73	36	7	—	1	—	5	—	—	1	4	18	6·2
Prisoners:														
Bengal Madras Bombay	103,159	539	806	2,947	1,059	223	89	60	65	38	12	7	6	56·7

Comparing the figures with those in the similar statements contained in our memoranda on the Reports of the Sanitary Commissioner with the Government of India for 1890 and 1891, it appears that, while not so prevalent in 1892, as it was in 1890, influenza was more so than it was in 1891,

and this remark applies not only to the figures as a whole, but also to those concerning each section of the communities to which reference is made, with the sole exception of the Native troops in the Bombay Presidency, who suffered less in 1892 than in 1891. In each of the years there is marked evidence of the differing intensity of the epidemic. In 1890 the minimum admission-rate was 19·4 among the European troops in the Bombay Presidency, and the maximum 136·6 among the prisoners in the Madras Presidency. In 1891 the range was between 1 among Madras Native troops, and 19·0 among prisoners throughout India, while in 1892 the minimum, as above shown, is 3·6 among Madras Native troops, and the maximum 56·7 among prisoners. The epidemic affected a very large area. In December 1891, after considerale abatement, it showed decided signs of revival, it continued during the early months of 1892 with some severity, and then in August it almost disappeared. Among European soldiers in the three Presidencies not a single case was recorded after that month. Among native troops serving in India the only exception to this same rule were 4 cases at Quetta in November and 17 in December, an exception which is not to be accounted for on the supposition that the disease had only reached this distant part of the country thus late in the year, because a few cases had already been recorded there in the months of February, March, May, and July.

7. *Cholera.*—It is gratifying to find that in a year when cholera was so widely prevalent over India the mortality which this disease occasioned among the European troops was only 2·42 per 1,000 in Bengal, ·53 in Madras, and ·94 in Bombay. The 167 cases which occurred among European troops in all three Presidencies were distributed over 33 different stations, the largest number in any one of them having been 27 at Ferozepore. Among native troops throughout India the cholera deaths equalled 2·14 per 1,000, and the 424 admissions from this cause took place in 73 different cantonments, or bodies of soldiers on the march, the large number of 60 having occurred at Almorah and its outposts. In the jails the disease was more prevalent. Sixty-eight of them were attacked and in several of these the mortality was serious, notably in Coimbatore, where of 127 cases 62 were fatal. We have already in our memoranda on the Provincial Sanitary Reports for 1892 noted the principal facts regarding the incidence of cholera among the general population. In the Report now under review the statistics of cholera in all the provinces have been collated, and the general result is that never has any cholera epidemic in India been known to be so destructive to human life. The total deaths aggregated 762,695, the largest number that has ever been recorded. An interesting question arises in connection with this severe epidemic, which, it will be remembered, was not limited to 1892 but had extended also over 1891, when the registered cholera mortality, already considerably less than that which followed in 1892, was still the heaviest that had occurred since 1877. The question is this—Does such increased prevalence of cholera in India mean increased danger of the disease attacking other countries? In the recent International Sanitary Conference which assembled at Paris, we observe that it was sought to place such a construction on the figures of recent cholera mortality in India, but it was based on purely theoretical grounds. No facts were adduced to show that extraordinary prevalence of cholera in India had been followed by the extension of the epidemic to European or other countries. The matter is deserving of further investigation, both as regards the past and the future, for it is one of much practical import. So far as we read the history of cholera, we believe that there are good grounds for concluding that prevalence of cholera within a given area and epidemic movement beyond that area are two entirely different things, and that the one is not to be regarded as the cause of the other, because they are by no means commonly associated. Much interesting information regarding cholera is contained in this Report, but there are two points in regard to which we should like to have the facts in future more fully detailed. In paragraph 157 we read that among European troops in 9 of the 38 outbreaks "cholera is said to have been imported," and in other seven "this was thought to have been the case." A similar remark follows regarding Native troops and prisoners. A mere counting of opinions on such a matter is of little value. The Sanitary Commissioner might with advantage examine the evidence in each case, and show how far the opinion is substantiated by the facts. Another matter of great practical importance is the effect of moving into camp. It is recorded that these were "generally satisfactory," but it would be very useful to know what appeared to be the reasons of failure where the move was not successful. Had it been delayed till too late, or was there some other cause, it may be some undiscovered cause, why the disease was not arrested? A full account of what occurred in such outbreaks, for example, as those two already referred to among the Goorkhas at Almorah, and in the Coimbatore jail, would help to furnish an answer to such questions. The statement that "48 parties were encamped from 19 jails, and 74 seizures were recorded subsequent to removal," leads to the inference that removal into camp was not made so promptly in the case of prisoners as it ought to have been, for 897 cases of cholera occurred among them during the year. Of these all but 74 would seem to have occurred in the jails. There is no preventive against cholera which has proved so valuable as removal from the affected locality, but it requires careful watching to ensure its being carried out with the promptness which is essential to success.

9. *Malarial Fever.*—In a year when, as evidenced by the mortuary statistics of the general population, fevers of a very severe type were unusually prevalent and fatal over great part of India, it is not to be wondered at that among the troops both admissions and deaths under this head show a decided increase over those of ordinary years. Under all three forms, of intermittent, remittent, and simple continued, this result is observed for the European Army as a whole; but if the statistics of the Presidencies are separated, it will be seen that the fever prevalence was confined to Bengal and Bombay. Madras escaped, and in the south the year was remarkable for the small proportion of cases. The group which includes this part of the country returns only 131·0 admissions per 1,000, whereas in the

Indus Valley group they equalled 1,097·6 per 1,000. There are discrepancies in the fever ratios between those of Table XVIII. and those of Table XXVI. which we are unable to reconcile. The fever ratios above quoted are the aggregate of the figures of Table XVIII., showing the admissions per 1,000 from intermittent, remittent, and simple continued fever, but in Table XXVI. the malarial fever cases appear as only 71·0 per 1,000 in the one group and 987·4 in the other. Similar differences appear in other groups. If we look at the details of Table XXVI. we see further evidence of the inequality of the fever distribution, and find it even in different cantonments within the same group. In the Upper Sub-Himalayan group the range is between 84 at Bareilly and 1,527 at Amritsar. There was also an increase of malarial fevers among Native troops during 1892. If we take the returns for the whole of India there is no great difference in their prevalence among them and among European troops, the admissions having equalled 550 per 1,000 in the one case and 504 in the other. A comparison of groups and stations shows the same marked extremes. In the station of Wuntho in Burma, among a small body of men, malarial fevers give the maximum admission rate of 3,652 per 1,000, but even this high ratio is exceeded by the return of 3,781 in the Central jail at Lahore. In the jails of the Northern Punjab generally, and of the Upper Indus valley, these fevers were extraordinarily prevalent; but for the prisoners thoughout India as a whole the admission-rate, 526 per 1,000, did not differ much from that of the troops.

9. *Enteric Fever.*—Enteric fever in the Report is shown separately from malarial fevers, and this has been the practice for many years. It is, no doubt, desirable that this should be done, as this fever is characterized by a specific lesion, but it is still open to doubt whether the division between the two is strictly logical. The year under review, as we have already remarked, was one of remarkable fever prevalence over great part of India. So was 1891, and in both years the mortality from enteric fever among the European soldiers was very heavy. The usual experience as regards the greater liability of young and unacclimatised soldiers to this form of disease is again repeated. As to the cause to which these unsatisfactory results are due no new light has been thrown. The Sanitary Commissioner observes: "The practical conclusion of the whole matter is an old one, that to "protect the men of the army of India from enteric fever it is necessary to have soldiers clean and "well cared for in every respect, internally as well as externally, placed in clean surroundings, and "to extend the area of cleanliness far beyond cantonment limits; in fact, ultimately throughout the "length and breadth of India. It is a good thing to secure the cleanliness of the immediate "environment of the troops, but they will never be safe as long as the Native population and its "towns and villages are left uncleansed to act as a reservoir of dirt and disease." Such reforms are doubtless most desirable, but in endeavouring to ascertain the causes of any special disease we must not ignore the facts, and it is a very singular fact, which as yet admits of no explanation, that the Native population who live in the midst of this "reservoir of dirt and disease" do not suffer to any appreciable degree from this enteric fever which proves so fatal to British soldiers, especially during their early service in India. Of this we have decided evidence in paragraph 80, from the 20 years' records of the post-mortem examinations of fever patients in the Calcutta General Hospital, and from the testimony of Dr. Crombie, who, as the result of his long experience, "was not aware of ever "having seen a case of enteric fever in a native of Bengal, though he had seen cases among Goorkhas "and Burmans." The returns of both Native troops and prisoners fully bear out this remark. The statistics of 1892 show the death from enteric fever of 15 officers and 376 European soldiers. The reports of the medical officers might enter more fully into the antecedent circumstances. More might, we believe, be accomplished by a careful examination of the history of each case previous to attack, showing how far the disease may be accounted for by unusual exposure or fatigue, by indiscretion in diet, or any other special cause. This is already done in respect of cholera, and a similar summary of the evidence annually gathered regarding all the cases of enteric fever would be a valuable addition to the Sanitary Commissioner's Report.

10. *Venereal Disease.*—Next to malarial fevers, venereal diseases continued to be the main cause of inefficiency in the European army as a whole. In Bengal, and in Bombay, also, this was the case, but in Madras they occupy the first place, and account for 415 cases per 1,000, the proportion contributed by malarial fevers being only 239. For the last five years the general venereal ratios for the European army of India stand thus per 1,000 of strength:—

1888	370·6
1889	418·5
1890	503·5
1891	400·7
1892	409·9

The ratio for 1892 shows an increase of 9 cases per 1,000 over 1891, but the rate for 1891, it will be observed, was over 100 per 1,000 less than it was in 1890. Still, even with this diminution as compared with 1890, it admits of no question that in 1892 venereal diseases prevailed among European soldiers in India to such an extent as to constitute a most serious cause of inefficiency. In a separate memorandum which we submitted in December 1893, we discussed this question at some length, and gave the reasons why we arrived at the conclusion that the evil had been very slightly mitigated in India under the lock hospital system, and that the re-introduction of this system on sanitary grounds could not be recommended. We need not pursue the subject further now, but it may be useful to reproduce here a statement which was appended to that memorandum, showing the statistics of venereal disease among the men serving in the United Kingdom for the six years during which the Contagious Diseases Acts were more or less in force, and the next six years when they had

ceased to be in operation, and from which it will be seen that the ratio of admissions per 1,000 has decreased since the Acts were abolished :—

TABLE showing the ADMISSION and CONSTANTLY SICK RATES for VENEREAL AFFECTIONS in the UNITED KINGDOM during the 12 years 1881–92.

Year.	Ratio per 1,000.		Remarks.
	Admitted.	Constantly sick.	
1881	245·5	16·67	Contagious Diseases Acts in force.
1882	246·0	16·86	
1883	260·0	18·54	Contagious Diseases Acts partially repealed in May.
1884	270·7	20·14	
1885	275·4	19·34	
1886	267·1	19·29	Contagious Diseases Acts repealed in March.
1887	252·9	19·10	
1888	224·5	18·19	
1889	212·1	16·96	
1890	212·4	17·07	
1891	197·4	15·34	
1892	201·2	16·46	

These figures suffice to show how very little influence the Acts could have had in diminishing venereal disease, under conditions more favourable to their operations than those which exist in India.

11. *Local insanitary Conditions.*—There are many other points of interest in connexion with the health of the European soldier in India on which we might dwell, but we shall confine ourselves to a consideration of the causes of disease so far as they are set forth in this Report. Of general causes, such as climate and the very unhealthy character of the year, we need not speak, as these are matters beyond control; but we may again note in passing, as a matter for congratulation, that in both 1891 and 1892, when sickness was so generally prevalent and severe, the mortality among the European troops was not greater. The ideal which the Royal Commission on the sanitary state of the Army in India set before them was that, with an improved state of things, the death-rate among British soldiers in India might be reduced to 20 per 1,000, but, even in these two unhealthy years which we have mentioned, the mortality was only 15·89 in the one and 17·07 in the other. There still remain many local causes of disease, and the great aim and object of the Sanitary Department is to endeavour to discover what these are, and, if possible, to apply a remedy. It was with this great and practical end in view that the annual Cantonment and Sanitary Reports were instituted, and we turn to the abstract of these reports, commenced on page 182, for valuable information on this subject. We find, however, that these reports include only those cantonments which are in the Bengal Presidency. It is very desirable that those in the other two Presidencies should also be included, and that in every instance where sickness was prevalent the local cause, if discovered, should be pointed out and that if not discovered a remark to that effect should be made. In not a few of the Reports mention is made of prevailing sickness, but nothing is said of insanitary conditions. We referred to these defects in our Memorandum on the Report of the Sanitary Commissioners with the Government of India for 1891, but the subject is of so much importance that we have thought it right to refer to them again here.

12. *Sickness and Mortality in the Native Army.*—In our remarks on European troops we have already referred to certain points connected with the health of the Native Army. The general results of the year were that, owing to the prevalence of influenza and malarial fevers, there was an increase in the sick-rates, but that the mortality was less than in the year previous. According to Presidencies sickness was greatest in Bengal, 1,234 cases per 1,000; then comes Bombay with 1,130, and Madras with only 868. As regards mortality the order is different. Here, including deaths among men on leave, Bombay returns only 12·48 per 1,000, Bengal 19·70, and Madras 23·00, a result due to Burma, the Native garrison of which is largely composed of Madras troops. In many of these Burman stations sickness was extremely prevalent. Among the small garrison of Wuntho the admissions into hospital attained the very high ratio of 4,575 per 1,000, and in 10 other stations of Burma they exceeded 2,000; but these unfavourable returns are more than neutralized, as regards admissions, by the small proportion of sickness among Native soldiers in other Madras stations. In nearly all the Burman stations the death-rate was heavy. Omitting very small bodies of men, there are eight stations in which the rate exceeded 30 per 1,000; among these the range is from 33 to 94 per 1,000. The summary of the sanitary sheets of Native corps, unlike the Cantonment Sanitary Reports, includes all the three Presidencies, and notes every detachment separately. We thus have the means provided for comparing the extent of sickness and mortality in each locality with the condition of the place itself. As we have remarked in former memoranda, the information on this last point might be more full, and we still hope that in future Reports endeavour may be made to make this practical part of the annual Report as full as possible. Among the insanitary conditions which have been noted, one of the most common was overcrowding. As a rule this was only slight and temporary, but in other cases it was more serious and long continued. At Wuntho, for example, where, as we have already seen, sickness was at is height, there was "continuous overcrowding," and in other places it existed for months. Among other causes adduced to account for disease, we

observe the following—insufficient clothing and diet while on field service, privations and hardships of former campaigns in unhealthy parts, damp and malaria, imperfect drainage, heavy duties, impure water, food of inferior quality, exposure to wet, defective conservancy, want of personal cleanliness, errors in diet, climatic conditions, defective ventilation, rank cultivation and irrigation in the immediate neighbourhood. Of these some are beyond control, but most of them are capable of being dealt with in such a way as to prevent their becoming causes of sickness. Overcrowding in particular is an evil which is attended with special danger.

13. *Sickness and Mortality among Prisoners.*—As might have been anticipated from the generally unhealthy character of the year, the statistics of both sickness and mortality among the prisoners throughout India during 1892 were not favourable. As so commonly happens when provisions are dear, there was a considerable increase in the jail population in several of the provinces, and more especially in Madras. It is not surprising, therefore, to find that the evil of overcrowding to which we have drawn attention in former years, existed in very many of the jails during 1892. As usual malarial fevers were the chief form of sickness, followed at a long interval by dysentery, diarrhœa, and respiratory diseases; the main causes of mortality being first dysentery, then respiratory diseases, next diarrhœa, and after that cholera. In Table XV. an interesting comparison is made of the statistics of sickness and mortality in the different provinces, and in subsequent tables similar information is given regarding individual jails. The Sanitary Commissioner has already drawn special attention to those in each province in which the death-rate was high, and we shall take a few figures he has extracted from the general Tables and consider them in connection with the information contained in the sanitary sheets summarised at page 107. Of all the administrative areas the Andaman Islands present perhaps the most unsatisfactory results as compared with former years, for in spite of their continued exemption from cholera, which is so remarkable, the death-rate in 1892 rose to 50·78, the average of two former periods having both been under 30 per 1,000. The Andaman convict settlement is not included in the summary of sanitary sheets, and we would suggest that this omission should be rectified in future Reports. In Burma there were seven jails in which the mortality varied between 48 and 102 per 1,000. In them, the insanitary conditions noted are various, such as unsuitable clothing, defective drainage, "climatic causes," defective ventilation, bad water, and some overcrowding. The Gauhati jail in Assam is selected for special notice on account of the very high death-rate of 133·33 per 1,000 but the sanitary sheet does not record the causes of this very fully. It says, "Drainage defective "during heavy rains. Water-supply unsatisfactory. The jail is between a native bazaar and a filthy "tank. Dysentery due to malaria and exposure." In the North-west Provinces and Oudh 22 jails are noted as having returned a death-rate above the average of the province as a whole, the rate in each varying between 30 and 75 per 1,000. In 13 of these there was more or less overcrowding. At Ghazipur the sickness and mortality are ascribed chiefly to "admission into jail of prisoners in a "half-starved and broken-down condition of health consequent on the failure of crops in the preceding "year." The same remark is made concerning Basti and Gonda, and although nothing is said of this cause of unfavourable results in the other jails on this list during 1892, even where, as in the jail at Aligarh, the admissions (1,846) and the mortality (60·61) were both very high, there can be no doubt that the dearness of provisions and the privations which the prisoners had in consequence suffered before incarceration must have exercised a very prejudicial influence on the jail statistics during the year. In the Punjab 15 jails were distinguished by excessive mortality and in many of them sickness was remarkably prevalent. We have already noticed the extraordinary admission-rate of 4,547 in the Lahore Central Jail. Although none of the others attained to this maximum, sickness was very prevalent in all of them and the death-rate varied from 30 to 75 per 1,000. In several overcrowding is recorded as one of the insanitary conditions present, but, as a rule, sickness is referred not to any local defects but to general causes operating over the whole district. At Shikarpur, in the Bombay Presidency, where with only 732 admissions per 1,000 the deaths equalled 121·60 per 1,000, it is said there was "overcrowding throughout the year," but it is added that the "ventilation was excessive and warm clothing insufficient." We find, on reference to the Tables of individual jails, that more than half of the deaths among the prisoners at Shikarpur were due to pneumonia. It is usual to ascribe such diseases to chill or cold, or want of sufficient clothing, but there is good reason to believe that the pneumonia which is so frequently observed among Indian prisoners, and which proves so fatal, is not due to such causes but to impure air acting on constitutions already debilitated by malarial fever. On this point we fully agree with the remarks made in his last report by Surgeon-Major Bate, Inspector-General of Prisons in the Punjab. We have said enough to show how important it is that in the case of each individual jail the extent of sickness and mortality should be studied in immediate connection with its local conditions, and how much more complete information is desirable under this last head. Of the jails in the other provinces it will suffice to note that more or less overcrowding was a common defect in Bengal proper, and also in Madras.

14. *Further researches on Cholera.*—A very interesting paper which has been written by Brigade-Surgeon Lieutenant-Colonel D. D. Cunningham, Special Assistant to the Sanitary Commissioner with the Government of India, is abstracted in the concluding paragraphs of this Report. It contains the results of a long continued and careful investigation into the much vexed question of the comma bacillus. Certain distinct forms of comma bacilli have been in continuous cultivation in the Calcutta Laboratory for four years, and various others for periods ranging from over three years to one year and a half; and the conclusion at which Brigade-Surgeon Cunningham arrives after an examination of all the evidence is, that there is no one specific choleraic comma bacillus, and that "any theory "ascribing the choleraic condition to the action of any distinct species of intestinal organism which has "yet been discovered comes to the ground."

15. *General conclusions on all the Indian Sanitary Reports for* 1892.—We have nothing further to add to what we have already noted in the memoranda on the Provincial Sanitary Reports as regards the general population. We are gratified to find from a recent despatch* of the Government of India that most of the suggestions we have made in our previous memoranda, mainly concerning the Provincial Reports, have been adopted, and we shall await with interest the results of the alterations proposed. We shall not make any further suggestions regarding these Provincial Reports at present, but we would recommend in respect of the Report of the Sanitary Commissioner with the Government of India, that more definite information should be furnished every year on the following points:

(1.) Regarding the Indian pilgrims proceeding to Mecca and returning therefrom. In our memorandum on the Report of the Sanitary Commissioner with the Government of Bombay we have detailed the exact points on which data are wanted.

(2.) Regarding sanitary works in each Province, such as drainage and water-supply, as distinguished from money spent annually on conservancy and other establishments. It is very desirable to show by a comparative statement what every province is doing annually in this important matter.

(3.) It would be well to add to this a comparison of the statistics of mortality in those places where such improvements have been carried out, with their experience of former years, and also with that of other places where no improvements had yet been effected.

(4.) That Annual Cantonment Sanitary Reports should be furnished from all cantonments and not only from those in the Bengal Presidency, and that in preparing them, and also the sanitary sheets of Native troops and jails, great care should be taken to make them as complete as possible.

(5.) That a sanitary sheet should be introduced for the Andaman Convict Settlement.

(6.) That as regards cholera an analysis should be given of the evidence adduced in those instances in which it is alleged that the disease was due to importation.

(7.) That in all cases in which movement into camp has not been successful in arresting cholera outbreaks a full account should be given of the circumstances, and of the causes which seem to account for the failure.

(8.) That a summary should be given of the antecedent circumstances, if there were any worthy of note, in the history of all European soldiers annually attacked with enteric fever.

19th July 1894.

No. 2.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Bengal for 1892.

1. *Unhealthiness of the Year.*—The most remarkable fact in the sanitary history of Bengal for 1892 is the great unhealthiness of the year. In 1891, which was also a time of unusual sickness and mortality, the deaths registered reached a total of 1,896,261, but in 1892 the total rose to 2,247,275, or from 26 to 31 per 1,000. The increase is to be found among both sexes, in all ages, and under all the great heads or causes among which the deaths are recorded. Cholera, small-pox, fevers, dysentery and diarrhœa, and other causes all show a more or less decided advance in the death-rate, the only item in which there is a decrease being injuries. Nor are these results confined to one or more districts or divisions in which exceptional sickness prevailed to such an extent as to affect the statistics of the whole province in an unfavourable way. On the contrary, the greater unhealthiness of 1892 seems not only to have been very marked, but also widely diffused. Of the 46 districts all but seven return a higher mortality than they did in 1891, and in many of them the difference is very great, as for example, in Backergunge, where it rose from 27 to 43 per 1,000; in Balasore, from 26 to 43, and so on with many others that might be named. If the towns are taken by themselves similar results are to be found. Of the 145 mentioned in the comparative statement given at page 10, 104 returned a higher death-rate than in 1891, and many of them a much higher death-rate. There can be no question then that the statistics of 1892 indicate a great and widespread increase of disease among the people of Bengal during that year, even when compared with the unsatisfactory results of its immediate predecessor. It is true that some part of this increase may be fairly ascribed to improvement in the registration, but this is a quantity which cannot be even vaguely estimated. Some measure of it might have been arrived at by comparing the statistics of troops and prisoners and of the charitable hospitals and dispensaries of the province for a series of years, and it is very desirable that the facts regarding all these should be noted in Annual Sanitary Reports so far as they are available. There seems no doubt, however, that the year 1892 in Bengal was singularly unhealthy. Improved registration is to be credited with some part of the increase in the recorded mortality, but by no means with all or even the greater part of it. The general opinion of the district medical officers was that the year was decidedly unhealthy, and this opinion is shared by the Sanitary Commissioner.

* No 6, Sanitary, dated 28th February 1894.

2. *Causes of Unhealthiness.*—But when we come to ask what were the causes to which this greater unhealthiness is to be ascribed, we are at once struck by the small extent of our knowledge in regard to the various factors which are at work in determining the character of individual years in this most important matter of the public health, and also in regard to the proportion of the results which is to be accounted for by each of these factors. As we have frequently observed, two of the most powerful of them seem to be the meteorology and the food supply, and on both of these some information is given in this Report. At page 7 there is a summary of the principal meteorological features of the year, opposite page 17 is a map showing the rainfall, and in Appendix II. there is a comparative statement of the mortuary and meteorological statistics of the different districts, together with the prices current of the chief food grains for 1892 and the five previous years. As regards food the evidence is very distinct. Prices were very high, and this condition is decidedly unfavourable to the public health. Over all the districts the general tendency is to show a gradual but decided rise in the cost of the main articles of food since 1887, and a very marked increase in 1892 as compared with it predecessor. The Sanitary Commissioner also observes that the conditions as regards the meteorology were "such as to be decidedly unfavourable to health during the year "under report," but this remark seems to require further elucidation. The whole subject is confessedly one of great difficulty, and the tabular statements containing the figures connected with it are necessarily very complicated. Moreover, even when the deductions which the facts of one year would seem to warrant appear to be very plain, they seem to be contradicted by the facts of another year. It is evident that to be really useful the data contained in this statement ought to be given month by month, so that more exact comparison may be made between the extent of sickness and the causes with which it seems to be connected. Under any circumstances, a careful examination of this kind is a matter of much difficulty, and the difficulties are further augmented by the large extent of country which Bengal comprises and by the varying conditions which exist in different parts of it. Any attempt in this way to analyse fully the annual facts over the whole province would take up too much time and divert the Sanitary Commissioner's attention from more practical matters, but it is very desirable that there should be a more extended effort in every province to utilise the facts recorded, in the hope that in time more light may be thrown on the causes which differentiate an unhealthy from a healthy year. As the province presents the question on too large and complicated a scale, certain districts in each might be selected for the purpose, and results as regards health worked out in connection with meteorology and food prices, care being taken at the same time to consider any other conditions that deserve notice.

3. *Registration of Births.*—As the census figures of 1891 had not been published when this Report was written, the Sanitary Commissioner was not yet able to use them for a full examination of the birth and death statistics in municipalities during the ten-year period 1881 to 1890, as we suggested in our Memorandum on the Bengal Sanitary Report for 1891. Unfortunately, it is only in the municipalities that this check can be employed, as the births were registered in them only, but with 1892 a more extensive record has been commenced, and the population among whom the births are registered is the same as that among whom the deaths have for years been registered. We are glad to observe that this extension, coincident as it has been with making over the work of registration entirely to the police, has been attended with considerable improvement, and the total result is an average birth-rate for the province of 28·15 per 1,000, as compared with only 21·46 in the municipality during 1891. This so far is satisfactory as an instalment of greater accuracy. Full details for each registering circle are given in Table I. of Appendix I. From this table we learn that there are 703 of these registering circles, 558 of these being rural circles, and the remaining 145 towns. We observe that a few of these last contain much fewer than 5,000 inhabitants, which was, we understand, the limit decided on to distinguish between town and country areas. For the sake of uniformity and proper comparison of the statistics of the various provinces, it is desirable that some such limit should be adhered to. Considering the population, the number of registering circles in Bengal is small compared with that of some of the other provinces. In the North-Western Provinces and Oudh, with about five-sevenths of the Bengal population, the number is 1,128, and in the Punjab, with only two-sevenths, it is 445. In dealing with the statistics of different provinces it is of some importance to recognise the size and population of each circle, as one of the elements likely to affect the results, as *cæteris paribus* the difficulties are doubtless increased the larger they are. Such arrangements must, however, to a large extent be governed by local conditions, and we merely, therefore, draw attention to the fact.

4. *Suggestions for Improvement.*—It would be easy to point out that, though there has been a gratifying improvement in the registration of births as a whole, the details as supplied in Form I. show how much has still to be done to secure even fairly accurate returns. But our object is not so much to point out flagrant errors, which are already well known to the authorities, as to suggest means of improvement for the future. The revised form, by giving the figures for every registering circle separately, should prove very valuable for the purpose, as it shows how the district and provincial averages are made up, and points out where there is evident neglect which requires attention. In our Memorandum on the 1891 Report we suggested a diagram, such as has been long employed in Bombay, to illustrate the various grades of birth and death registration, and we observe that in its orders on this Report the Government of India has forwarded this suggestion to Bengal for opinion. Whatever system is adopted, what is clearly wanted is that prominent attention should be drawn to manifest defects. It is not enough to enter the figures in a diagram or tabular statement. They must be impressed on the district and other officers concerned. To take an example from this Report for 1892. it should be shown that the birth-rate in the Patna district ranges between 13 and 35 per 1,000, and that in every one of its 18 circles the number of births recorded is evidently more or less short of the

truth. The average for the district is only 27, or not much more in all likelihood than one-half of what it is in reality. In the same district the proportion of male to female births varies from 76 to 115. The Sanitary Commissioner cannot do more than point out very clearly evident inaccuracies, and trust the local authorities to remedy them.

5. *Registration of Death.*—The same remarks apply in great degree to the registration of deaths. The details of Form No. II. of Appendix I., giving as they do particulars regarding each registering circle, invite much the same comments as the details regarding the births given in Form No. I. There is evidence of some improvement, but it must be remembered that the registration of deaths has been in force for years, and it is under these circumstances disappointing to find so many entries that are manifestly incorrect. Until the details for the circles were furnished it was impossible to say how far the statistics had even the appearance of accuracy, and now that they are furnished it is highly important to use the valuable information they contain as a means for obtaining better results. For example, it is not creditable that the rural circle of Serampore, in the Hooghly district, should return a death rate of only 5·58 for 1892, and an average death-rate during the last five years of only 6·45. It would be very creditable, no doubt, if it were true, but we know it cannot be true under any circumstances, much less when we read, as we do in the sanitary estimate of towns and villages, that the "drainage flows towards *bils* and swamps," and that the water-supply is from tanks, "most of which contain bad water." With the registration in such a state little progress can be expected, and the first step towards reforming their insanitary surroundings is to realise what their actual death-rate is. Many other examples of a like kind might be cited, but it is sufficient to draw attention to one. It is for the local authorities to examine all their circles one by one, with great care, and not rest satisfied with district averages. Before considering the chief diseases to which the mortality of the year is attributed, and the local conditions noted in connection with them, we may here tabulate the figures under each head for the Province of Bengal as a whole.

Causes of Death in Bengal during 1892.

Population by Census of 1891 = 70,388,083.

Causes of Deaths.	Numbers of Deaths registered.	Ratio per 1,000.	
		1892.	1891.
Cholera	259,398	3·68	3·26
Small-pox	22,359	·31	·23
Fevers	1,607,716	22·84	18·94
Dysentery and diarrhœa	48,491	·68	·61
Injuries: suicide	3,078	—	—
„ wounds and accidents	14,255	—	—
„ snake-bite or wild animals	10,371	—	—
Total injuries	27,704	·39	·41
All other causes	281,607	4·00	3·47
Total from all causes	2,247,275	31·92	26·94

These figures set forth very clearly the great mortality of 1892, even when compared with the unhealthy year that immediately preceded it. It is of interest to note how far the death-rates under each head compare with those of other provinces. In respect of cholera, five of the total of 11 show a higher mortality than Bengal, and four a higher mortality from small-pox. The fever-rate of Bengal is second highest on the list, but it falls far short of 34·83, the fever death-rate of the Punjab. The total mortality from all causes stands thus:—Punjab, 49; North-West Provinces and Oudh, 34; Central Provinces, 34; Assam, 34; Bombay, 32; Bengal, 31. The others have lower rates.

6. *History of Chief Diseases: Cholera.*—As we have already remarked, the year was one of very great cholera prevalence. In 1891 there had been a severe and wide spread epidemic; but in 1892, making due allowance for the increase dependent on improved registration, the disease would seem to have caused more deaths than it did in 1891. The Sanitary Commissioner says that "it prevailed "epidemically in 192 registering circles against 159 in 1891, severely in 160 against 138, with slight "severity in 334 against 382, and was absent from 17 against 13 in 1891." The epidemic is ascribed to the drought in the early months of the year, the abnormally high temperature, and the progressive deterioration of the water-supply. "Coincidently with the breaking of the rains and the consequent cleansing and replenishing of the sources of drinking water, cholera began to abate." This is the usual course of events in the Lower Provinces, but the fact which has been so frequently pointed out must not be lost sight of, that in Upper India the very reverse order of things frequently obtains and cholera is prevalent during the rains. Some of the worst epidemics in this part of India have occurred in rainy seasons which have been distinguished by an unusually heavy fall. In Bengal it was on the districts of the Orissa Division that the severity of the 1892 epidemic chiefly fell. They had suffered comparatively little in 1891. In the eastern districts on the other hand, and more particularly in Dinajpur, Rangpur, and Jalpaiguri, the experience was just the reverse, for these places suffered much in 1891 and but little in 1892. It will be remembered that in the Bengal Sanitary Report for 1891 one of the chief factors in producing the destructive cholera epidemic of that year was said to have been the great Ardhodya Jog fair. In our memorandum on that report we gave our reasons for doubting this conclusion, and the experience of 1892 affords additional and very strong

grounds in support of what we then wrote, for in 1892 there was no such fair to which the results can be ascribed, and yet the cholera of that year was even worse that it had been in 1891. The extracts from the Civil Surgeon's reports which are cited show that in not a few instances the cholera was attributed to importation by human intercourse, but the evidence adduced is vague and unsatisfactory. The Civil Surgeon of Birbhum, for example, says that the outbreak in that town in May was traced to a man who came from the Sonthal Pergunnahs and died from cholera; that he had bathed in a tank, and that soon afterwards several others were attacked and in all 25 died, but many more exact details are wanted before such an explanation could be accepted, especially as we find from Annual Form No. VII. that in other parts of the Birbhum district nearly 1,000 deaths from cholera had been reported before the occurrence in the town of Birbhum could have taken place. There was no need, therefore, to import the disease all the way from the Sonthal Pergunnahs, for it was already present in the immediate vicinity, and before the year closed 348 villages of this district had been attacked, though it is worthy of notice, as evidence of the remarkable localization of the disease, that the great mass of the villages, numbering 3,330 in all, escaped. It is very right and proper that Civil Surgeons and others should investigate all phases of the cholera question, but to be of any value the evidence must be complete and accurate, and as a matter of practical sanitation likely to lead to good results it is very much easier to search for the local conditions which produce or favour the disease, than to search for the individual who is believed to have brought the disease.

7. *Small-pox and Vaccination.*—The deaths from small-pox were much more numerous than in any of the other years for which statistics are given. These statistics being with 1882 and range between a maximum of 18,533 in 1884, and a minimum of 4,049 in 1886. In 1892 the number was 22,359. It was, however, only in the districts of Puri, Cuttack, Lohardaga, Dacca, and Hazaribagh that the mortality from this cause was high. The maximum was 2·34 per 1,000 in the district of Puri. Among the towns Lohardaga leads the way with a ratio of 7·17. The Vaccination Report is for the three years, 1890–91, 1891–92, and 1892–93, and it notes as the distinguishing feature in the last of these years that the contemplated change in the administration of the department had been carried out, and that the civil surgeons had become superintendents of vaccination in their respective districts. It is too early to judge of the working of the new scheme. The district returns disclose very marked differences which cannot be explained. The general result for the province is an increase in the number of vaccinations performed, which for 1892–93 stands at 1,836,411. At page 4 of this vaccination report an interesting and important statement is given showing what the births in each district would be if taken at 40 per 1,000, and how many successful vaccinations were performed among infants under one year of age. Allowing a certain proportion as being from death or sickness not available for operation, it proceeds to show what ratio per 1,000 of those who were available had, according to the returns, been actually protected by successful vaccination. The district ratios framed on this basis vary from a maximum of 544 per 1,000 for Darjeeling to a minimum of only 6 for Puri. The statistics so tabulated are of great practical value and ought to be studied by all the local authorities, for the protection of the infant population is the first duty of the Vaccination Department. Re-vaccination is no doubt very desirable at later ages, but the primary portion of the work is that which should call forth the greatest exertions. In our memorandum on the Bengal Sanitary Report for 1890 we drew attention to the confusion which seemed to exist in using the terms "re-vaccination" and "secondary vaccination," and we observe the same confusion in this Report as, for example, in statement No. 1, in which a number of infants under one year of age are entered as having been successfully "re-vaccinated," which is not possible if the term were used in the sense in which it was intended. As regards the inspections of the vaccinations by the civil surgeons and other superior officers, which is so essential for verifying results, and also on the evidence forthcoming in this Report on the amount of protection from small-pox which vaccination has conferred on the people, we have nothing to add to what has been already said on these points by the Local Government.

8. *Fevers.*—As already shown, the deaths recorded under the head of fever amounted to more than two-thirds of the total mortality, 22·84 out of 31·92. The main causes of this great and apparently increasing loss of life are, in the Sanitary Commissioner's opinion, want of drainage and bad water. In some districts the rate was excessively high, as for example in Rajshahi, where it attained a maximum of 37·13. In the 16 districts which suffered most it is worthy of notice that almost without exception there is evidence of decided increase of fever in late years. Unfortunately the prevalence is associated with great structural changes, such as rivers altering their course, which present very difficult and expensive problems, but, according to the Sanitary Commissioner, these evils would seem to be aggravated by railways and roads, in the construction of which sufficient water-way has not been provided. Further inquiry on this important matter is very desirable. If we turn to the record of the towns, as shown in Annual Form No. VI., we find how largely fevers contribute in every one of them to the deaths of the year. In a good many of them from this cause alone they equalled more than 30 per 1,000 in 1892, and in one reached to nearly 50. In comparing such figures, however, it must be borne in mind that they are to be accepted with much reserve, as deaths which in one place would be returned under the head of "fevers," in another place appear under another disease, or swell the ratio of mortality under "all other causes." Under the last heading the variations are very marked.

9. *Sanitary Defects.*—The tabular statement which forms Appendix V. deals with the sanitary defects to which fever and other diseases in towns and rural circles seem to be due. As such it is of great value, for even when the state of things is much the same as it was in the previous year, the evils still existing should be brought to notice unceasingly until they have been removed. The defects are tabulated under the three great heads of water-supply, drainage, and conservancy, and further

details are given regarding ten towns inspected and reported on by the Sanitary Commissioner. The defects are very patent, but the means of remedying them are less clear. In the towns the difficulties are more easily overcome, but the towns hold but a small part of the population of Bengal. We have therefore read the officiating Lieutenant-Governor's remarks on rural sanitation in that province with much interest. As his honour observes, "The sanitary question in Bengal in its various phases of "silting up deltaic rivers, obstructed drainage, uncleanly towns, and unhealthy villages, is the pressing "question of the day, and the solution will not grow easier by being postponed." The very large and difficult question of general drainage is to be separately considered, and in regard to the improvement of local conditions within the villages themselves, so that they may be provided with pure water and kept in a cleanly state, it is suggested that village unions should be formed, and public criticism is invited as to the best means by which the needful funds may be raised for the proper working of these unions. Although no definite conclusions have been formed, and no decided plan of action decided on in these orders, we regard them as marking a new departure in the village sanitation of Bengal, where little has hitherto been done in this direction, no doubt in great measure because the difficulties of dealing with it in this province are greater even than they are in other parts of India.

10. *Sanitary Works.*—The statement, which is devoted to a record of the improvements effected during the year, divides them into those which were executed in the interior of the district and in the towns, and in regard to these last there is also another statement (page 43), to show what proportion of the income of each was expended on original sanitary works, how much on sanitary works of an annually recurring nature, and how much on other items. Although no great works of either water-supply or drainage were executed during the year, and though the total expenditure on sanitary improvements is very small, especially when compared with the great needs of Bengal in this respect, there is evidence that a decided desire for such improvements had been awakened. Surveying instruments, which were hired out by the Sanitary Board so as to encourage local bodies in their designs and save the cost of purchasing them, were so much in demand that further sets had to be obtained. Numerous projects were formed and rough estimates made. Surveys in various stages of progress were numerous; so numerous in fact were applications for such surveys that it was found necessary to issue orders to bring them under greater control. The report for 1893 will, it is hoped, show much work actually accomplished as the result of all these preliminary proceedings. It would add very much to the value of the Annual Sanitary Report if the Sanitary Engineer were to submit with it a brief memorandum showing what he had been able to accomplish during the year. We observe that the Government of India in its orders on this report for 1892 has drawn attention to this point.

11. *Sanitary Board.*—Although the Sanitary Board held only one formal meeting during the year, much good work was done, as may be seen on reference to their proceedings and circulars as recorded in Appendix VII. No change was made in the constitution of the Board, but we observe, in the orders already referred to, that it is proposed if any large plan of rural sanitation be undertaken, such as has been suggested, that its constitution should be broadened and brought more into touch with local bodies.

12. *Calcutta Port Health Officer's Report.*—The report of the Health Officer of the port of Calcutta, which forms the last Appendix, contains interesting particulars regarding the sailors, both European and Native. The only point in it to which we wish to refer relates to the pilgrim traffic to the Red Sea. It is very desirable, with reference to the continued allegations that pilgrims from Indian ports take cholera to Jeddah and so on to Mecca, that as much information as possible regarding them should be systematically collected and placed on record. With this object we would suggest that statistics should be given every year in the report of the Health Officer of every Indian port, showing the names and other particulars of all pilgrim ships, the number of pilgrims in each, and the general state of their health on departure. This should be followed up by a medical history of the voyage, showing the number and dates of all cases of cholera that may have occurred, and if in addition a record could also be obtained of the number of pilgrims who return to India after the pilgrimage is over, very valuable data might in time be collected. We propose to discuss this subject more fully in connection with the Annual Sanitary Report for Bombay, at which port the great mass of the pilgrims for Mecca embark.

8th June 1894.

No. 3.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of the NORTH-WESTERN PROVINCES and OUDH for 1892.

1. *Signs of Sanitary Progress.*—This Report is interesting, and in many respects encouraging, for it shows that real progress is being made in sanitary matters, as indicated by the attention devoted to the registration of births and deaths among the people, and by the endeavours which are being made to improve the local conditions of the towns and villages in which they live. When we consider that the population of the United Provinces amounts to 46,905,085, that they cover an area of nearly 109,000 square miles, and contain 105,283 villages, besides 101 towns varying in size from a minimum of about 10,000 inhabitants to the maximum of nearly 250,000 in the one city of

Lucknow, some idea may be formed of the magnitude of the task which has been undertaken, more especially when we bear in mind that the agency by which the work has to be done is necessarily so weak in numbers, and in all but its higher grades so ignorant and illiterate, and, moreover, that the time-honoured habits and prejudices of the people are, nearly all of them, diametrically opposed to the reforms which it is desired to introduce. Under such circumstances progress must be slow, and, indeed from some points of view, it is desirable that it should be slow. If it is slow, it is all the more likely to be sure, provided it is based on sound practical principles. All we can usefully endeavour to do in our memoranda on the Sanitary Reports is to inculcate such sound principles or to point out any instance in which there seems to have been a deviation from them, to note where the information given appears defective, and to propose means for rendering it more complete in the future, and we are glad to note that the suggestions which we have made on such matters have in many instances been acted on. Such remarks apply more or less to all parts of India, but they are specially applicable to such a large area and vast population as are embraced under the Government of the North-West Provinces and Oudh.

2. *Registration of Vital Statistics.*—As regards the registration of births and deaths some of the remarks made in our memorandum on the Sanitary Report for 1891 apply equally to this report for 1892. The results for this year have been carefully analysed by the Sanitary Commissioner, and much attention is evidently devoted to this important work, which is confessedly carried on under very great difficulties. It is desirable, however, to recur to the subject of the inspection of the primary registers by the various officers of the Government on their tours, and more particularly by the civil surgeons and by the vaccinators who are so directly interested in ascertaining the correct data regarding births and also regarding all deaths from small-pox. A good beginning has been made in both these directions. In paragraph 51 a table is given showing the results of the tests of the accuray of birth and death registration by certain revenue and other officers, but we observe that only those districts, 19 in all, are included "from which the returns are approximately accurate." It is desirable that in such a table all the districts should find a place, as the object in view is not so much to illustrate the degree of accuracy attained as to discover the places in which there is manifest inaccuracy, and where the registration therefore needs more attention. In the next place, the Deputy Sanitary Commissioners in their reports which are appended to that of the Sanitary Commissioner might give much interesting and useful information on what their experience was in inspecting the registers. A few examples of what they found by such local examination, and what was the nature of the prevailing errors, whether they were merely errors of omission or were in any way fictitious. All such information would be of service in administration, and would also throw light on the general condition of the registration throughout the country. The reports of the Deputy Sanitary Commissioners at present add very little to our knowledge of what this condition is. The report of the deputy of the First Circle makes no mention of the registration. In the Second Circle the deputy remarks as the result of his inspection of a number of towns, thanas, and villages, that "as a rule the matter is well attended to." The remarks of The Deputy Sanitary Commissioner of the Third Circle are also of a general character. The birth and death registers of 1,600 chaukidars had been examined; "they appear to be more carefully kept than in former years, although still far from being accurately so."

3. *Registration of Births.*—There is another and valuable check which the Sanitary Commissioner can exercise on the registration returns, and that is a careful examination of the units of which the various district averages are composed. In some of the smaller provinces the instructions of the Government of India, which were evidently directed towards the attainment of such a comparison, have been carried out, and in Forms I. and II. the results of the registration in each circle are given one by one. In the North-West Provinces, where there are 1,128 such circles, this could hardly be done without inconvenience, but the same practical object would be in a great measure gained if the Sanitary Commissioner were to show for each district the highest and the lowest rate recorded among the different circles. As regards births, especially, such a comparison of the extremes would show at once where the registration seemed to be faulty, and local inquiry was needed. Even if we take the average rates for districts, which is a much less searching test than the ratios of the circle units, the discrepancies in the birth-rates are very remarkable, varying as they do between 20 in Dehra Dun and 46 in Moradabad. The low birth-rate in Dehra Dun would seem by Table No. I. to be accountable to some extent at least by the smaller proportion than ordinary in the number of women, but the large percentage of males among the births (115) is another indication of error which is not to be explained in this way. At the same time it is to be noted that four other districts, where the birth-rate is much more correct than that recorded in the Dehra district, return even a higher percentage of male births than Dehra does. In 14 of the 48 districts the deaths exceeded the births, the highest excesses being 22 per 1,000 in Dehra and 24 in Naini Tal, where, however, the population is to a large extent migratory, and therefore likely to yield abnormal results. All the evidence points to much neglect of registration in the district of Dehra, a fact which is well known to all the authorities and has been repeatedly commented on by them. The great fluctuations in the birth-rates of the town are shown in the last statement appended to the report. The town rate, as a whole, averages 34, but this is made up of ratios from 13 to 51 in individual places. We observe that the question of tabulating the birth-rate in every circle, and communicating the results to municipal and district boards, was under consideration.

4. *Registration of Deaths.*—Interesting statements have been given to show the population in the different districts according to the Censuses of 1881 and 1891, as compared with that deduced from the birth and death registration during that ten-year period, and, as we have before remarked

the general confirmation of the registration figures which such a comparison supplies is gratifying. When the report was written the report of the Census Commissioner on the census of 1891 had not been published, and the Sanitary Commissioner has therefore deferred any extended criticism of the figures in their bearing on matters connected with the public health for another year. We proceed, therefore, to consider the record of deaths for 1892. The main facts are that these were more numerous than usual, and that the chief cause of the increase was an epidemic of cholera. The details are fully stated in the Report, but we may note here how the total mortality of 34·11 per 1,000 was made up. It stands thus :—

Cholera	4·15
Small-pox	·16
Fevers	24·90
Dysentery and Diarrhœa	·90
Injuries	·53
All other causes	3·46
Total	34·11

These are the results for the province as a whole, but great extremes are to be found in different districts, and, if the comparison be extended to registration units, even more striking fluctuations become apparent. These may be seen in the tabular statement which occupies pages 37 to 44 of the Report. It is not necessary to recapitulate figures which have been already shown in the Sanitary Commissioner's review, whether as regards the maxima and minima in towns and country districts, the mortality by sex or age or season, but we may draw attention to one satisfactory result, and that is that, with an increase of the total death-rate over the province for the year, the death-rate in the towns had considerably decreased. This very gratifying fact is attributed to the lesser hold which cholera was able to get over the towns compared with the country distsicts. The Sanitary Commissioner remarks that "extensive sanitary works are undoubtedly effecting a marked change for "the good in the health of the urban areas." We have no doubt that this improvement will become more and more apparent as these works extend. These sanitary works are fairly to be credited with the reduction of the town deaths from those of former years, but the results for 1892 as a whole do not altogether bear out the Sanitary Commissioner's conclusion, for although the mortality from cholera in the towns was only 1·99, compared with 4·31 in the rural tracts, there was very little difference between the two if all the causes of death are taken into account, and that difference was adverse to the towns, the ratios being 34·06 for the country and 34·78 for the towns. Such comparisons, when instituted over large areas, are always more or less subject to fallacies, and would be more valuable if confined on the one hand to towns in which great sanitary improvements have been effected of late years, and on the other to those where such improvements have not yet been carried out. There is only one other point in regard to the general question of the mortality to which we need refer, and that is "the verification of the causes of death during 1892 by the medical officers "of districts and other medical men." The results of this verification are contained in four statements in which the deaths from the various diseases entered are arranged according to months and age. The distribution of these deaths by districts would have been a valuable addition to the record. The general conclusion arrived at is that "the excessive percentages of mortality from malarial fever "disappear when proper tests are adopted and accurate diagnosis ensured." There can be very little doubt that this is correct, and it has long been recognised that a large number of the deaths recorded under the general head of "fever" might with greater accuracy have been entered under some other head, but there was, first of all, the difficulty of diagnosis, there being no one on the spot capable of pronouncing what the disease really was, and secondly, there was the other difficulty that in the very simple form of return designed for the use of people altogether ignorant of medical matters there was no place in which the correct entry could be made. So far every one acquainted with the subject must agree with the Sanitary Commissioner that, as regards the causes of deaths, and more particularly as regards the deaths attributed to *fever*, no great dependence is to be placed on the registration, but, as we have frequently remarked, nothing better can be had at present, nor can much improvement be expected for years to come. But for all practical purposes the existing returns afford an excellent basis for sanitary work, for the mere fact of a high death-rate is sufficient evidence to show the necessity for improving local conditions. We observe that the Sanitary Commissioner draws another conclusion from these verification returns, and that is "that infectious disease exists to "a greater or less extent among the Native population, and that many of the *fevers* are infectious in "their nature, and not of malarious origin as frequently supposed," but we can discover very little in the figures to support this opinion.

5. *History of the Chief Diseases: Cholera.*—Of the chief diseases which form the headings of the mortuary statistics there are only two in regard to which we need offer any remarks, and these are cholera and small-pox. The cholera epidemic was very severe, and the deaths it occasioned fell but little short of the maximum they attained in 1887. There are some circumstances in the cholera history of the year as compared with that of its predecessor which deserve attention. In 1891 the deaths numbered 169,013, or 3·60 per 1,000. Of these there occurred in the four upper divisions of the province (Kumaon, Rohilkhand, Meerut, and Agra) 79 during January, 498 during February, and 292 during March. The Kumb fair at Hurdwar was held that year early in April. The great bathing day was on the 12th of that month. All passed off well. There were one or two suspicious cases but no outbreak of cholera at the fair or among the pilgrims as they dispersed to their homes. This happy result was attributed to the excellent sanitary arrangements, and there seemed, indeed,

every reason for congratulation. The appearance of the disease in the earlier part of the year, before the fair was held, especially in some of the districts near Hurdwar, and its prevalence in the district of Kumaon, which is not far distant, naturally led to grave apprehensions, but these forebodings were not realised. In 1892 the general mortality from cholera throughout the United Provinces was even higher than it had been in 1891. The deaths numbered 194,866, or in the ratio of 4·15 per 1,000. In the four divisions above named, before the fair commenced, the disease had not been prevalent in any part. The deaths in them were only 17 for January, 12 for February, and 122 for March, a great contrast to the same months in 1891, but although the same care was exercised in the sanitary arrangements as in the year previous, cholera broke out at the fair in the end of March, and the dispersed pilgrims suffered severely. In the one year the efforts appeared to have been successful, in the other they altogether failed. This failure is attributed to the fact that "the sending of a constant "stream of fresh water all through the bathing pool, which removed all impurities very quickly, "was less effectively applied than in the former year." There was a smaller volume of water in the river, and the current was obstructed by impediments which it is noted have since been removed. It is important that this and every defect should be remedied, so that all the arrangements may be as perfect as possible, but we can hardly believe that the marked difference in the results of the two years is to be so explained because it will be remembered that specimens of the water from the bathing pool in 1891 on examination were declared to be teeming with what were pronounced to be cholera bacilli. It does not seem probable that they were really germs capable of producing cholera for, as already mentioned, the disease was limited, if it existed at all, to one or two suspicious cases. But the evidence is important as showing that the water in 1891, notwithstanding the more rapid flow, was still loaded with impurities. It seems very clear that in both years great and widely operating causes were at work, for if we compare the deaths from cholera in the first half of each of the two years we find ample evidence to this effect. The figures stand thus:—

	January.	February.	March.	April.	May.	June.
1891	718	1,115	2,077	13,273	31,915	34,453
1892	949	697	3,437	31,913	58,087	39,066

In both years there is the same sudden rise in April and a further increase in May. In the one year there were no cholera stricken pilgrims, in the other year there were; but the general course of the epidemic is much the same in both. Those who regard pilgrims as the great means of disseminating cholera should study the facts, and compare the years in which great epidemics seemed to be caused by pilgrims with other years in which severe epidemics occurred without any outbreaks at the great fairs which could be adduced to account for them. They should also remember that the influence of pilgrims in disseminating cholera merely resolves itself into the general question of contagion as the means by which the disease is spread. There is no *bacillus* or other germ peculiar to a pilgrim. He can produce no other special germ, if there is any germ at all, than any other individual suffering from cholera can produce, so that the effect of pilgrimages on cholera distribution must be judged in the light of all the facts bearing on contagion in relation to cholera. Of the impossibility of explaining the facts on any such hypothesis the history of the cholera in the North-West Provinces and Oudh during 1892 affords renewed evidence. It is only necessary to look at the statistics of the disease month by month in each district, or to examine the very clear cholera map given in the Report, to see how inadequate any theory of this kind is to account for the results. We see some great cause operating more or less over the whole province, and distinguishing the year as one of great epidemic activity; we see some areas suffering greatly, several of these being parts of the country least open to traffic, and through which the means of communication are comparatively scant; we see other parts to which and through which the traffic is great and constant, suffering but little, and throughout all the districts, whether those that suffer most or those which suffer least, we have the same evidence of localization—the same remarkable immunity of the greater number of the villages they contain. These considerations are not merely of theoretic or academic interest, they lie at the basis of all sound sanitary work. Any arrangements for the suppression of cholera which are based on endeavours to prevent personal contagion must end in failure, especially in a country like India where such arrangements are simply impossible. The only refuge is to be found in sanitary improvements, especially in securing a good wholesome water supply, and we are glad to see that in the North-West Provinces all the authorities concerned are fully alive to the importance of such improvements, and that in the towns, as we have mentioned in a previous paragraph, there is evidence that good results have already been effected by this means, that with sanitary improvements there has been a reduction of cholera mortality. It is impossible, in the present state of our knowledge, to say why cholera attacked the Hurdwar fair in 1892 any more than it is to say why, under, to all appearance, much more threatening circumstances, it did not attack the Hurdwar fair in 1891. We can no more explain this than we can explain why one village suffers while others around it, with free communication, escape. The great facts we know about cholera are its remarkable localisation, and that the best and only means of preparing for any such localisation is to have every sanitary improvement carried out in case such localisation should take place.

6. *Small-pox and Vaccination.*—We have said so much in regard to cholera that we must confine ourselves to a very brief comment on the returns of small-pox and vaccination. The information given under this head is, as a whole, very satisfactory. The mortality from small-pox was less than it had been in any previous year, and the ratio of ·16 bears favourable comparison with that of 3 or even

4·5 per 1,000 recorded formerly. The detailed statements relating to towns and districts show that the Sanitary Commissioner has his eye on the localities where the disease prevailed. In a few of each there are high ratios, Gorakhpur heading the districts with 0·64 deaths from small-pox per 1,000 and the town of Pilibhit with a maximum of 2·19. The work of vaccination has continued with remarkable activity. The total number of persons operated on, the number of these operations which were successful, and the proportion of infants protected by this means, are all indicative of progress. This progress is all the more marked when the results of 1892–93 are placed side by side with those of earlier years. In 1881–82 the total number of persons sucessfully vaccinated was 684,026, whereas in 1892–93 it was 945,364. The statistics of infant vaccination also represent a large increase, but even with this large increase the proportion of these successful vaccinations to the total births of the year, after due allowance has been made for deaths, occurring among the children before they could be vaccinated, shows that a large field stills remains to be occupied. The Sanitary Commissioner very properly insists on the value of the vaccination, but there can be little question that the great aim of the Vaccination Department should be in the first place to overtake the infants every year, and that until this is accomplished other work, however valuable, should be regarded as of minor importance. In illustration of the effects of vaccination on small-pox, a statement is given in which the number of successful primary operations and the deaths from small-pox in each district of the North-West Provinces and Oudh are compared for a series of 10 years. This statement would be still more useful if the results were shown in ratios as well as actuals. The actuals answer very well for the comparison of different years in the same district, but until they have been worked into ratios they are not of much use for comparing one district with another. No doubt the preparation of such a statement involves considerable labour to start with, and it would year by year take up a good deal of space; but it is well worth all the trouble it may involve, for it ought to be the sheet anchor on which the Department should mainly rely. The record of the large and increasing number of successful vaccinations and other data, all telling of much excellent work done, is most satisfactory, but the only real test of its excellence is the influence it has had in the diminution of small-pox. We believe that much good has been done in this direction, but the more this is clearly put in evidence, district by district and town by town, the better, not only as proof of good results obtained in the past, but as the best basis for securing the hearty co-operation of the people themselves.

7. *Sanitary Defects and Improvements.*—Appendix B. presents a *resume* of the local conditions affecting the health of the people in nearly 300 municipal cities and towns (under Act XX.). The high death-rates recorded in many of them are in themselves ample evidence of the defects in these conditions, while the particulars noted under the heads of "Drainage," "Water-supply," and "Conservancy," show in what these defects mainly consist. We shall not quote any illustrations of the necessity for reforms, because we are well aware that the Government of the North-West Provinces and the local authorities are well acquainted with the facts, and fully alive to the importance of dealing with them to the utmost of their ability, but we would emphasize the great value of a statement of this kind, so that the Sanitary Commissioner, and all other authorities concerned, may keep before them a simple and yet striking reminder of the enormous amount of work to be done. Much has been already accomplished, and it is satisfactory to find in this Report that the activity which has specially characterized the later years in this part of India continued in 1892. Following the Agra and Allahabad waterworks, which were completed in 1890 and 1891, those at Benares were opened in the year of report, and among other great works commenced are the drainage and sewerage of Benares and a water supply for Cawnpore and Lucknow. At Naini Tal a system of drainage and sewerage was near completion, and similar measures of reform for other important places were under consideration. The account of minor improvements undertaken in other parts makes up a satisfactory record of the year's work.

8. *The Sanitary Board.*—The Sanitary Board remained unchanged, but owing, it would seem, to the fact that it possesses no executive authority, the results so far have not been altogether satisfactory, and its reconstitution was being considered. On many important matters it advised during the year, and the outcome of one of these is the Village Sanitation Act of 1892, copy of which is appended to the Report. Projects for the improvement of drainage in certain districts, and especially in those in which the need for such improvement was most pressing, for improving the vital statistics, and also the best means for giving practical effect to the Village Sanitation Act, engaged their attention, all matters on which the further progress of sanitary reforms in the province largely depends.

8th June 1894.

No. 4.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Punjab for 1892.

1. *The most unhealthy Year on record.*—This report is the history of a terribly unhealthy year. In 1890 there had been unusual sickness in the province, and the mortality equalled the very high rate of 46·87 per 1,000. In 1891 there was a remarkable improvement and the ratio fell to 29·13. But in 1892 the state of the public health has been worse even than it was in 1890, and the result is the highest death-rate that has ever been recorded in the Punjab, 49·48 per 1,000. The extraodinary

fluctuations in the annual extent of sickness and mortality among the people in eastern countries are well known to those who are conversant with Indian statistics, but they are very apt to be lost sight of by others in considering the history of diseases, and especially of epidemics. There could hardly be a more striking illustration of these fluctuations than is afforded by the experience of the Punjab during the years 1890 to 1892, as exemplified in the ratios just quoted, and as may be seen more in detail in the following statement showing the following deaths from all the chief causes which were registered in each of them. We have preferred to retain the actual numbers, because they appeal to the understanding more directly and impressively than the ratios, but we have added the ratios for 1892 in order that the component parts of the total death-rate of that year, which we are now specially considering, may be stated for future reference.

Causes of Deaths.	Number of Deaths registered.			Deaths per 1,000 in 1892.
	1890.	1891.	1892.	
Cholera	3,401	10,107	75,959	3·70
Small-pox	8,922	3,426	11,173	·54
Fevers	692,511	442,254	715,890	34·83
Dysentery and diarrhœa	17,163	12,152	21,781	1·06
Injuries	5,689	5,882	6,547	·32
All other causes	155,463	124,968	185,673	9·03
Total, all causes	883,149	598,789	1,017,023	49·49

Under nearly every head the healthiness of 1891 as contrasted with the year on either side of it is very marked. The only exception, in fact, is under cholera, which was more prevalent in 1891 than it had been in the previous year, to be followed by the very severe epidemic of 1892.

2. *Births.*—The comparatively high birth-rate of 38·16 per 1,000 in 1892 is attributed in part to the healthy character of the preceding year, and partly to the efforts which had been made to secure more complete registration. Form No. I. has not been expanded as has been done in other provinces, so as to show the births recorded in each circle separately. The comparison is thus confined to districts only, nor is there any analysis in the chapter of births of the circle ratios from which the district rates are prepared. Such an analysis is very necessary as a check on registration, and also as a means of studying the distribution of the births every year more fully. In Appendix D. there is a statement showing the births and deaths registered in each of the 45 large municipal towns, and in them we find the rate fluctuated between 25 and 51. The great majority, however, return between 35 and 45 per 1,000. The proportion of males born to every 100 females is an indication of inaccuracy, especially in the frontier districts. In the Peshawur district, where this error is most marked, the proportion is 154 males to every 100 females. In all the districts the proportion of males seem abnormally high. For a province as a whole it averages 113, the lowest being 105 in the Kangra district. In the other provinces in 1892 it varied from 104 to 110. The general birth-rate for the Punjab is much the same as that of the Central Provinces, and falls little short of 39, which is returned by the Hyderabad Assigned Districts, and is the maximum for the year.

3. *Deaths.*—As already mentioned, the mortality of the year reached the very high and altogether unprecedented figure of 49·48; the deaths exceeded the births by 11·32 per 1,000. Annual Form No. II., which deals with death, is wanting in details regarding the registration circles, just as No. I. is, but this defect in regard to deaths is made up in great measure by Appendix A. in which the mortality in each district is shown by municipalities and thanas. The district ratios range between 23 at Simla and 66 in Bannu. Setting aside the first of them as probably erroneous, it is worthy of notice, as indicative of the widespread unhealthiness of the year, that of the 31 districts in the Punjab only two returned a mortality of less than 40 per 1,000. We have already shown the fluctuation in the number of deaths which are to be found over the province as a whole during different years, and we may illustrate the same truth by comparing a few of the districts taken separately.

Districts.	Number of Deaths Registered.		
	1890.	1891.	1892.
Sialkot	103,307	37,385	68,609
Gujranwala	53,031	21,911	33,613
Gujrat	54,762	22,292	32,541
Mooltan	19,441	18,814	35,003
Montgomery	14,854	12,064	28,892
Jhang	13,944	12,800	21,709

It will be observed that the first three were the most unhealthy in 1890, whereas the last three suffered most in 1892. An examination of the detailed death ratios in municipalities and thanas furnished in Appendix A. discloses extraordinary variations, not only in different parts of the province.)

but also in neighbouring places within the same district. The maximum and minimum death-rate in the following districts will serve as examples:—

Districts.	Maximum.	Minimum.
Hissar	87	28
Gurgaon	63	23
Delhi	81	41
Karnal	60	36
Umballa	66	26
Hoshiarpur	90	27
Jullundur	98	31
Ludhiana	64	38
Ferozepore	63	34
Montgomery	114	34

In one thana of the Mooltan district the mortality is given as 217 per 1,000, but the population is too small for statistical purposes. The very high rates for some of the others quoted above seem hardly credible. The mortality in the Punjab during 1892 far exceeds that recorded in any of the other provinces. The nearest approach to it is 34, which was the ratio for the North-West Provinces and Oudh, for the Central Provinces, and also for Assam.

4. *History of the Chief Diseases. Cholera.*—The year was distinguished by the most severe epidemic of cholera that is known in the Punjab. In 1891 there had, as has already been shown, been a considerable increase in cholera mortality as compared with the year previous. The disease appeared in April of 1891 in two of the southern districts, and after that was present more or less over nearly the whole Punjab till the end of the year; in only five of the 31 districts was no death from cholera reported. There is no question, then, as to the wide distribution of cholera over the Punjab in 1891, and in two of the frontier districts deaths from cholera were recorded as late as December of that year. One of these districts was Bannu, and here in January 1892 the epidemic still continued, and 60 deaths from it were recorded. In Kohat in February 18 were recorded, then in March a very few cases followed in 13 other districts, and in April the disease was more or less rife in every district except one on the frontier, where registration is very imperfect. In May the epidemic culminated in the death of 25,252 persons during that month alone. In June the number fell to 21,203, and then gradually subsided till in December the disease seems to have completely disappeared. Here, then, we have the summary of a great epidemic lighting up over a wide area much about the same time, and the question naturally arises, to what cause or causes is it to be attributed? The Sanitary Commissioner believes that the early and rapid distribution of the disease was due to the pilgrims returning to the Punjab from the Hurdwar fair, which, in consequence of cholera, had been broken up on the 24th March. He writes, "It thus appears that cholera made its "appearance in 14 out of the 31 districts of the province within seven days of the breaking up of "this Hurdwar fair, that in other four weeks the disease broke out in other 15 districts, and that, "with the exception of the frontier district of Dera Ghazi Khan, the disease was present in epidemic "form in every district of the province within five weeks of the time pilgrims began to leave "Hurdwar." These facts, however, present nothing new in the history of cholera or different from the experience of years in which there was no movement of pilgrims coincident with and seemingly accountable for them. But the Sanitary Commissioner adds a statement showing in a number of places that the date of the first case in a pilgrim was anterior to the seizure of any of the other inhabitants. Such evidence as this, even if it could be thoroughly depended on, may merely show what is very well known already, that pilgrims in their worn-out and ill-fed condition are more prone to be attacked. But such statements must always be accepted with great reserve. Though nominally furnished by the Civil Surgeons, they must necessarily be prepared by the police, who in a matter of this kind are apt to present what best suits the views of those who are directing their inquiries. It will be observed that the statement refers to cases of cholera and not merely to deaths, and the discovery of the first case of cholera in any community, as has been shown by experience, is confessedly a matter of some difficulty, which is much increased when, as so often happens, the investigation into the facts is not made until some time after they have occurred. Evidence of the kind which the statement contains is to be had in abundance from the police, although, as already stated, the inquiry is beset with difficulties, among which not the least are the size and large population of the districts with which they are concerned. The results form a remarkable contrast to the small amount of facts of a like nature which are to be obtained from medical officers in charge of troops and jails, though the circumstances in both these instances are so favourable for investigation, and the investigation is made on the spot by those who are well able to conduct it. If the Hurdwar fair were really the cause of the early and rapid diffusion of cholera over the Punjab in 1892, it is strange that many of the districts in its immediate vicinity suffered so little. Bijnor recorded a mortality from cholera of only 2·22, Moradabad 1·09, Bareilly 2·07, Mozuffernagar ·74, and Saharanpur, in which district Hurdwar is itself situated, only ·10. It is further strange, if the pilgrims were the bearers of the Punjab epidemic, that it should have been most severe in Bannu, which of all the districts is, perhaps, the most remote from Hurdwar. Here the mortality from cholera was 11·36. It is worthy also of notice that this district, as we learn from Form No. V., is composed more exclusively of Mahommedans than any other in the province, so that its connection with the pilgrimage was in all probability of a very limited character

But the matter is of importance only in so far as it effects practical sanitary work. Even if it were proved beyond all doubt that the pilgrims were the cause of the epidemic, what is to be done? Are all fairs to be stopped, or are the people to be taught to seek security by keeping the pilgrims at a distance? To stop the fairs is hardly to be thought of. To teach the people that safety is to be found in avoiding others, and especially those that are sick, is calculated to do much harm, because it diverts their attention from those sanitary improvements which are so necessary for the public health. Nothing has done so much to check such improvements as quarantine. Countries which have trusted to the delusive protection which quarantine promises have neglected to deal with the real causes of disease existing in their midst, and have continued to suffer. The same must be the result of all teaching of a similar character to the people of India.

5. *Small-pox and Vaccination.*—There was some prevalence of small-pox, especially as compared with the remarkable abeyance of this disease in 1891, but the death-rate contributed under this head in 1892 equalled only ·54 per 1,000. The district ratios varied between 4·08 in Bannu and a very small fraction in Jhang representing two deaths. What reason is there to connect these fluctuations with the amount of protection recorded as having been given to different districts by successful vaccination? This is a point which, as we have frequently remarked, ought to be very fully dealt with in either the Sanitary or Vaccination Report every year, but to be of much value as a test of the influence of vaccination in small-pox it is essential that the statistics of both vaccination and small-pox should be studied for a series of years. The average proportion of persons successfully vaccinated per 1,000 of the population in the Punjab during 1892 (33) is higher than in many of the other provinces, the maximum being 37 in Berar, but the average for the province is made up of rates varying from 11 in Hazara to 51 in Gurdaspur. In statement No. I. of the vaccination series, taken in conjunction with the small-pox mortality of 1892 as shown in annual form No. VIII., there are the materials for comparing small-pox and vaccination for six years:—

District.	Mortality from Small-pox per 1,000 of Population.		Ratio per 1,000 of Population successfully vaccinated.	
	In 1892.	Average in previous Five Years.	In 1892-93.	Average in previous Five Years.
Bannu	4·08	0·77	19·42	21·46
Kohat	2·45	0·91	20·37	19·26
Umballa	1·00	0·72	20·86	19·78
Delhi	0·08	0·33	33·68	28·72
Kangra	0·03	0·08	34·46	84·48
Jhang	0·00	0·22	24·16	29·71

We have taken three districts that suffered most in 1892 and three others that suffered little, and as a whole the evidence is in favour of those where vaccination was more actively and successfully carried on, but the scrutiny ought to be extended to all the districts and also to the towns taken separately. The Lieutenant-Governor has drawn attention in his orders on the Vaccination Report to several points of much importance, such as the large proportion of re-vaccinations in the total, the great variations in the degree of success claimed for re-vaccination in different places, and the need for issuing instructions to the operators as to what constitutes success. We fear, however, that nothing but practical experience will teach the vaccinators this lesson, and no person ought to be employed as a vaccinator who has not satisfied the controlling authority that he is thoroughly acquainted with all he has to do and can actually do it.

6. *Fevers.*—Of the total deaths of the year by far the greater number were, as usual, registered under the head of fevers. From this cause the provincial death-rate equalled 34·83 per 1,000, and the district rates varied between 24 in Rohtak and 49 in Gurdaspur. In addition to the many diseases which every year swell the mortality under fevers, there was a special cause which increased the ratio in 1892, and that was a wide-spread epidemic of influenza in the first quarter of the year, which prevailed more especially in the north-western districts. It is to be regretted that more information has not been given regarding this epidemic than what is contained in the above remark. Many interesting facts might have been ascertained regarding it and placed on record for future reference. As it is, a great wave of this peculiar disease has passed over India; no province seems to have escaped, and yet when all the information regarding it which is given in the sanitary reports has been collected it amounts to very little. The fever, however, which proved so destructive to the people of the Punjab in 1892 was in the main malarial, and followed the usual seasonal course of such fevers, being most severe in the autumn and early winter.

7. *Causes of Unhealthiness.*—We have said enough to illustrate the vast differences in the public health which are to be met with in the history of an Indian province from year to year. Such vast differences are not to be explained by accidental or other trivial causes. They must be dependent on some great natural laws, and it is one important part of the duties of the Sanitary Department to endeavour to ascertain what these laws are. In two material points the meteorology of the Punjab in 1892 was abnormal. During the first half of the year the rainfall was deficient, and the water-supply in many places was thus considerably reduced. To this cause, which entailed a greater

risk of contamination in the quantity which remained for use, the prevalence of cholera is in part ascribed. The figures of monthly rainfall in 1892 and other years are not given by districts or other localities, and it is therefore impossible to estimate how far the conclusion on this point is borne out by the evidence, though it is not to be questioned that where the water-supply was rendered more foul than usual it presented an increased danger. In the later months the rainfall instead of being defective was greatly in excess, and to this the severe epidemic of fever is ascribed. The excess was mainly in the third quarter of the year, and an interesting statement is given in which the amount of rain which fell in that quarter of 1892 is compared with the average of the same quarter during the previous seven years, and the fever deaths similarly placed side by side. In nearly all cases there is a marked connection between the two—a heavy rainfall is associated with a heavy fever mortality. In five municipal towns which returned the highest mortality of the year, varying between the enormous ratios of 90 and 67 per 1,000, the Sanitary Commissioner found on inspection that they were all suffering from very defective drainage, which had been aggravated by unusual rainfall and consequent floods. In respect of food, also, the condition of the people generally was unfavourable, for, though there was nowhere anything approaching to famine, there was considerable scarcity in many places.

8. *Sanitary Defects.*—As the Sanitary Commissioner remarks the great remedy for malarial fever is drainage, and we are glad to learn that many of the schemes of improvement in this particular which were mentioned in the Report for 1891, and which will materially affect large tracts of country, were being gradually carried out. Appendix A. is a record of the local conditions of the municipalities and thanas in each district as respects drainage, water-supply, and conservancy as compared with the total death-rate of the year, and in other columns information is given regarding the amount expended on establishments for securing cleanliness, and also some account of the measures taken to remedy the evils existing in each locality. The very high death-rates recorded in nearly every locality, both town and rural, are associated in most instances with grave defects, more especially in drainage and water-supply. In some places conservancy is fairly attended to, but in many it also is in a neglected state. The statement is one which is calculated to be of much practical utility, particularly to the local authorities in each district. Now that waterworks and other improvements have been provided for several towns and other settlements in the Punjab, it would be interesting to know how far such improvements have been followed by better health among the inhabitants. Evidence of this kind ought to be forthcoming, and should afford valuable aid in commending similar reforms in other places.

It is somewhat disappointing to find from the figures cited in paragraph 21 that the introduction of a good water-supply into Peshawur had not been attended with a more marked diminution of cholera, but the facts regarding one year in a single place are not sufficient basis for forming an opinion, and it is therefore most desirable that the subject should receive attention in future reports, and that the statistics of places where improvements have been effected should be carefully analysed, so as to show what results are to be ascribed to such improvements. In all such comparisons it is very necessary, as the Sanitary Commissioner has done in the case of Peshawur, to take the facts regarding the particular locality in question in conjunction with those of the surrounding country, for all epidemics, whether of cholera, fever, or any other disease, vary in intensity, and it is therefore essential to consider not only the means of defence afforded by improvements, but also the strength of the attacking force.

9. *Sanitary Works.*—Chapter IX. shows in each district what works of any importance had been completed during the year, or were more or less on their way to being put in hand. Among these may be mentioned the general schemes of drainage designed to relieve tracts of country where water now stagnates. In addition, designs for improving the drainage of many towns, and also for improving the water-supply, had been formed, and some of them put into execution. The financial statement of the Sanitary work done in 1892 shows that more was expended on this object during that year than in the year previous. The best method of disposing of the sewage, especially of towns—a question which presents so much difficulty in all countries, and in regard to which there is so great divergence of opinion—was engaging attention, and a special report had been called for on sewage farms in the Punjab, and on the utilisation of sewage for market gardening or other agricultural purposes. We observe that in 1892 the considerable sum of Rs. 1,28,804 was realised by the sale of manure and town sweepings.

10. *Sanitary Board.*—One of the most important matters taken up by the Sanitary Board during the year was the advisability of having a special sanitary engineer added to their body, and a recommendation to that effect was accordingly submitted to the Local Government. Nothing had been decided when the report issued, but an attempt was being made to provide such an engineer. No change took place in the constitution of the Board during the year. Their proceedings are summarised in Appendix B., and embrace many important matters bearing on the health of the province. Among others, we note that a copy of rules for the registration of vital statistics had been prepared by them, and had been issued under the orders of the Government, but no particulars are given of the nature of these rules. It is very desirable that all such papers should be given in full.

8th June 1894.

No. 5.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Burma for 1892.

1. *Slight improvement in Registration.*—Much of what was said in our memoranda on the Burma Sanitary Reports for 1890 and 1891 applies more or less to this Report for 1892. Sanitation does not make any material advance in this province, either as respects a more exact registration of births and deaths, or as respects the execution of public works of improvement which the condition of the towns and villages so much calls for. It is true that there has been some advance in the birth and death-rates towards the figures which might be accepted as, at all events, an approximation to the truth, but it is evident that a birth-rate of only 24 per 1,000 must fall far short of the reality, especially when the items are examined of which this provincial average is composed. During the 21 years for which the births are tabulated it appears that the rate has fluctuated between 17 and 25 per 1,000. In 1892, as already stated, it equalled 24, and if we omit Coorg and Rajputana, which are to a large extent removed from direct British control and are otherwise exceptionally circumstanced, this is the lowest birth-rate recorded by any Indian province during that year. The other provinces record rates varying between 25 in Madras, where, as in Burma, registration is defective, and 39 in Berar. Again, if the Burma death-rate be examined in conjunction with those of other parts of India, there is evidence of much shortcoming. In these the ratio varies between 22 in Madras and 49 in the Punjab; in Burma it equalled 20. The accuracy of the mortuary statistics is by no means to be gauged by the extent of the mortality, but there can be very little doubt, especially when the returns of individual towns and districts are investigated, that very many of the deaths which occur in Burma are never reported at all. There is, however, reason to believe, as the Chief Commissioner observes, that the registration of vital statistics has slightly improved during the year; and it is to be hoped that the measures employed to obtain more correct results may meet in the future with greater success. Among these it may be noted that the assistance rendered by the vaccinators is favourably spoken of. The test circles have not proved of much use.

2. *Births.*—Hitherto registration has been confined to Lower Burma, and it is not proposed to extend the system over Upper Burma at present, but steps are to be taken to introduce it there in some of the larger towns. The figures with which we have to deal are thus, as before, for Lower Burma only, for a population of 4,512,695, of which 2,387,627 are males and 2,125,068 are females. The total population is less by 82,874 than that given in the Report for 1891, as owing to the want of information the population of tracts not under registration could not then be deducted. This has now been done. In some of the towns of Burma no doubt, as the Sanitary Commissioner notes, the female population is short, but this cannot be held to explain the generally low birth-rate over the province as compared with other provinces, for in several of those which return a much higher birth-rate the females are in quite as great a minority as they are in Burma. Full particulars of birth registration are given in Annual Form, No. I., which has been expanded under the orders of the Government of India so as to show each circle separately. It appears from this that there are in Lower Burma 121 registration circles, of which 28 are towns and the other 93 rural areas. We may note, as a slight discrepancy, that in Forms VII. and others, dealing with individual diseases, the number of circles appears at 118. But what is of more importance, we observe that in the 1891 Report, the number of registration circles in the province was returned as 817. In 1892 it has been reduced to 121. The Sanitary Commissioner writes that "some difficulty was experienced in deciding what areas should be selected as circles of registration," but we apprehend that the intention of the Government of India was not to interfere with the already existing circles of registration, but only to provide for detailed information being furnished from each. When the circles are so largely reduced in number as represented by a diminution from 817 to 121, the object of such detailed data is to a great extent defeated. We feared, as we have already stated in some of our memoranda on the Reports for 1892, that the large number of circles might make the preparation of Forms I. and II. somewhat over bulky, but it would be much better in the interests of registration if the old number of circles was preserved, and details given for only some of those in each district, than to double up several comparatively small registering areas into one large one. The great object is, as far as possible, to localise the returns; first, because by this means attention may be drawn to the particular places where neglect of registration is most flagrant; and secondly, because, if any practical use is to be made of the registration, it is essential to discover the localities where low birth-rates or high death-rates prevail and point to unhealthy surroundings. The Sanitary Commissioner speaks of "townships," and some of his tabular statements are headed in this way, but it would avoid confusion if the ordinary division of the registration circles into "rural circles" and "towns" were adhered to.

3. *Deaths.*—The above remarks apply in great measure also to Form No. II., which deals with deaths, and which also is expanded, under recent orders, so as to show details of registering circles. We would suggest, as a minor improvement in both these forms, that the numbers in the first column should be a running number for the province, and not broken into a series of district numbers, as in this way the comparison of the results in different forms would be made much easier. The chief point to be noticed in the death returns is not only the extremes in different towns and districts, but also the marked differences in the mortality recorded at places within the same district. In the Akyab district, for example, the rate runs between 15 and 48 per 1,000, in Hanthawaddy between 13 and 33, in Pegu between 13 and 36, and so on with other districts. Were the data for the 817 circles

available, the ranges within each district would doubtless be even more marked still, and it is important, with a view to render the registration more accurate, that the results in all the circles should be carefully analysed, and prominent notice taken of figures which are manifestly incorrect. Not a few entries of mortality under 10 per 1,000 point to great neglect.

4. *Causes of Deaths.*—Although little dependence can be placed on the statistics as an accurate record of the mortality, they may be taken year after year as a fair index of healthiness and unhealthiness; and, judged by this rough standard, the history of 1892 is unfavourable, for of the previous 20 years only one presents a higher death-rate. This was in 1888, when it reached 23 per 1,000. Compared with 1891, the returns of 1892 show an increase of mortality under every great head, as may be seen from the following statement:—

1892.

Population according to Census of 1891, 4,512,695.
Births registered, 112,070 = 24·83 per 1,000.

Causes of Deaths.	No. of Deaths.	Deaths per 1,000 of Population.	
		1892.	1891.
Cholera	6,208	1.38	·52
Small-pox	1,463	·32	·29
Fever	44,422	9·84	7·76
Dysentery and diarrhœa	5,449	1·21	·91
Injuries: suicide	55	—	—
„ wounds and accidents	440	—	—
„ snake-bite or killed by wild animals	378	—	—
„ total	873	·19	·16
All other causes	31,818	7·05	6·29
Total all causes	90,233	20·00	15·99

The Sanitary Commissioner is inclined to attribute a considerable part of the higher mortality of 1892 to improved registration, but the Chief Commissioner, having regard to all the facts, does not accept this view, and is of opinion that 1892 was decidedly unhealthy, and that it was a year "probably as trying as any through which the province has ever passed." A statement is given with a view to compare the facts of death, meteorology, and food prices, but until registration in Burma attains greater accuracy, the basis for such comparison is wanting. It is, however, none the less desirable on that account that the facts, as collected annually, should be recorded, in the hope that the desired accuracy may gradually be attained. In the tabular statement which appears in paragraph 9, a comparison is made between the number of deaths and the rainfall of each month, but it is not clear how the figures of rainfall have been prepared or what they represent. They range from ·1 in January to 459·65 in July.

5. *History of the Chief Diseases: Cholera.*—Although cholera was much more prevalent than it had been in 1891 and in most of the other years with which comparison can be made, the mortality it occasioned was not heavy. For Lower Burma as a whole it averaged 1·38 per 1,000, but the average is made up of district ratios varying from *nil* in Tavoy and Mergui to 3·82 in Akyab. In the town of Akyab it equalled 7·85, and in the town of Paungde it reached the maximum of 11·14. The chief features in the history of the disease were its persistence in most districts over many months without any severe outbreaks, except in a few places, and also the fact, noticeable in the cholera experience of every province, that the towns and villages attacked bore but a small proportion to the total number in the province. According to Form No. VII. this total was 17,414, and of these only 1,497 returned deaths from cholera. Making every allowance for imperfections in the registration, this is a remarkable record. The Sanitary Commissioner writes: "There is no distinct "evidence of the disease travelling from place to place. Its origin remains as much a mystery as "ever, but it is certain that its propagation was caused and its virulence enhanced by local insanitary "conditions." From a practical point of view the great thing to be done is to search out these insanitary conditions, in order, if possible, to apply a remedy. Unfortunately, as a rule, little searching is requisite to discover them. Overcrowded and ill-ventilated huts, with the want of proper drainage and conservancy, are evils which present themselves frequently, and in addition there is a water-supply subject to be contaminated, and no doubt actually contaminated, by the vicinity of cesspools, which are so common, especially in the towns. The Chief Commissioner draws attention to the inconsiderable mortality from cholera in the towns of Rangoon, Prome, and Thaton, where the water-supply is satisfactory. It is important that all facts of this kind should receive ample illustration in the Sanitary Report, which should not only point out the dangers arising from insanitary conditions, but should also encourage their removal, by showing how, as evidenced by a diminished death-rate, such dangers have been reduced in places where similar insanitary conditions have been remedied.

6. *Small-pox and Vaccination.*—The deaths from small-pox, though somewhat more numerous than in the previous year, added only ·32 to the general mortality of the province. Taken by districts, the ratio varies between *nil* in three of them to 1·98 in Akyab. The town of Akyab returns the same

rate as the district to which it belongs, and the only other town in which the mortallty equalled ·20 per 1,000 is Pantanaw in the district of Irrawaddy, where it was 1·33. It is stated that small-pox is extensively propagated by the practice of inoculation, in which the people have much faith, "as soon "as small-pox makes its appearance the inoculators are busy at work, and the result is that in a short "time the disease is spread over a large area." These statements, however, do not accord with the facts recorded in the mortuary statistics. There we have evidence of a disease very widely spread over the province, affecting more or less every district except three, existing in several of them for the whole year and in others for great part of the year, and yet, as we have already seen, there was nowhere any violent local outbreak. Such facts cannot be accounted for by the practice of inoculation, nor can we on any such theory explain the very unequal incidence of the disease. Nor can we attribute this result to vaccination, because, although some progress is being made in Burma in protecting the people from small-pox by this means, the number of persons successfully vaccinated every year is still small, and the proportion of the annual additions to the population which is brought under it is very meagre. In Lower Burma, with a registered birth-rate of only 24 per 1,000, the births in 1892 numbered 112,070. The number of infants under the age of one year successfully vaccinated is returned as 26,415. Instead of 24 per 1,000 the birth-rate is probably 40, so that, after making due allowance for deaths and other causes reducing the number of these infants, there is a large balance every year which remains unprotected. More information is desirable on the influence of vaccination in the reduction of small-pox. The statement given at page 18 of the Sanitary Report does not adduce sufficient data for making a comparison between the two, as the "ratio of persons successfully vaccinated per 1,000 of population" in each district seems to be given for one year only, whereas it ought to be given for a series of years. An outbreak of small-pox is generally the signal for increased activity in vaccination, and so it frequently happens that an increased ratio of vaccinations, if one year's statistics alone are taken, is associated with an unusually heavy mortality from small-pox. The statement, in fact, when confined to one year, is rather calculated to illustrate the influence of small-pox on vaccination, than the influence of vaccination on small-pox.

7. *Fever and other Causes.*—Although fevers contributed by far the largest part of the total mortality of the year, nearly one half of the whole, the fever death-rate, 9·84, is small when compared with that in many of the other provinces. In fact, excepting Madras, where it equalled only 8·3, the fever ratio of Burma was lower than it was anywhere else—a result due no doubt in part to the general imperfection of the registration, for the accurate statistics of both troops and prisoners afford evidence of the great prevalence of fevers in many parts of Burma. The fever mortality in individual districts fluctuates between 4·70 in Thongwa and 18·21 in Akyab. In the 25 towns which appear in annual Form No. VI., the ratio fluctuates between 1·33 in Zalun and 23·79 in Pegu, but in Zalun registration appears to be much neglected, as the total mortality in this town from all causes is entered as only 12·99. In comparing the mortality from fevers in different districts and towns, it must always be borne in mind that the term is indefinite, because there are no means of attaining accuracy in diagnosis, and that very different items are therefore embraced under it in different places. Some estimate of this may be formed by taking the fluctuations under "all other causes" into consideration along with those under "fevers." A high fever-rate is not unfrequently coincident with a low rate from "all other causes." and *vice versâ.*

8. *Sanitary Defects.*—Reference has already been made to certain sanitary defects in connection with the cholera history of the year. Further particulars on this point are to be found in statements A_8 and B. of the Appendix, in the first of which information is given regarding the condition of the districts, and in the latter similar details regarding the towns. Both Lower and Upper Burma are included in these statements, but the column showing the death-rates can be filled up for Lower Burma only. Under the three great heads of Drainage, Water Supply, and Conservancy there is abundant room for reform. One great difficulty in Burma, as in all the provinces of India more or less, is the want of money, but the financial information which these statements afford is somewhat perplexing. As regards the district of Akyab, for example, it is said that the net income of the district cess fund was Rs. 1,26,505, and that of this Rs. 110 were spent "on sanitary works." In Prome, out of some Rs. 48,000, between Rs. 12,000 and Rs. 13,000 were spent on such works. It is difficult to understand such discrepancies in the proportion of the funds available for such an important purpose, and also how it was that in the district of Akyab, which is apparently one of the most unhealthy in the whole province, the small sum of Rs. 110 was all that could be had for such greatly needed improvements.

9. *Sanitary Work.*—The Chief Commissioner has already commented on the want of accuracy in the financial portion of the statements relating to sanitary works, and the absence in many cases of all information on the subject. The amount spent by the Public Works Department on such works in 1892 was remarkably small, being, in round numbers, only Rs. 20,000 for Lower, and Rs. 25,000 for Upper Burma. It would be well if the Sanitary Commissioner were to show clearly in his Report how much was done in each place by the combined aid of general and local funds, as the complete separation of the two renders it more difficult to follow the progress that is being made every year. No great works were executed in 1892, but certain measures of reform are noted which are of much consequence to the public health. Of these the most important is the closing of cesspits. In Akyab more especially, where the danger arising from these pits was illustrated by the recent cholera epidemic, a systematic effort was being made to do away with them, and some progress had been effected in this most desirable object. Other matters were under consideration, and several of them were well matured. Among these may be mentioned water-supply and conservancy schemes for Mandalay, a conservancy scheme for Moulmein, improvements

in the waterworks of Rangoon, and the reclamation of low-lying lands in the neighbourhood of this town.

10. *Sanitary Board.*—We regret to learn from the orders of the Government of India on the Sanitary Reports of 1892, as summarised in their Despatch, No. 6 (Sanitary), dated 28th January 1894, that the appointment of a Sanitary Engineer to Burma is not to take place at present. There was no change in the Provincial Sanitary Board during the year, but it was under consideration to relieve the Financial Commissioner of his duties as President of the Board, because his ordinary work demanded all his time and attention. The Board's Report for 1892 contains little information, and is almost entirely occupied with the steps to be taken for the preparation of survey maps of the towns.

8th June 1894.

No. 6.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Central Provinces for 1892.

1. *More information desirable as to the Census of* 1891.—In this report for the first time the Census figures of 1891 are employed for calculating the vital statistics, and the results of the year 1892 are also compared in certain particulars with those of the year previous as re-arranged on the same basis. More information might have been given with advantage regarding the new census from a sanitary point of view. The main fact recorded is that during the 10 years from 1881 the population of the registration circles of the Central Provinces had increased from 8,817,185 to 9,501,491, or in the ratio of 7·6 per cent., but no attempt has been made to show how these figures, either as a whole or in the different districts and towns, accord with the results to be deduced from the registration of birth and deaths during the same period. No doubt such a comparison is disturbed to a certain extent by the movements of the population, by the amount of emigration and immigration that have taken place, but still, when due allowance has been made for these disturbing elements, valuable conclusions may still be drawn from the facts. The composition of the population as regards sex, the proportion of marriagable females in town and country, and the proportion of children, has a very important and direct bearing on the vital statistics, and it is very desirable that attention should be drawn to these points so that they may be duly considered not only by the Sanitary Commissioner of the province, but also by the Civil Surgeons and other officers who are immediately concerned with the vital statistics of towns and rural areas.

2. *Great facts of* 1892.—The main facts in the sanitary history of the people during 1892 were that the birth-rate was abnormally low, that there was a slight increase in the death-rate, but that the year was generally more healthy than its predecessor, the slight increase of mortality having been due to the prevalence of cholera over a certain portion of the province. To this we shall recur when we come to consider the history of cholera during the year, but meantime would notice that the more healthy character of the year, excepting as regards cholera, is manifested not only by the provincial statistics as a whole, but also by those of the districts taken separately. Comparing the results of 1892 with those of 1891 we find that in the three districts mainly affected by cholera the death-rate rose greatly, but in all the other districts except one the rate was reduced. The exception was the district of Balaghat, where, owing to increase of cholera, there was a slight rise. As a step towards collecting information as to the great general causes to which the marked variations in the health of the people from year to year are due, a chart has been furnished for each district, showing the monthly rainfall and also the mean fall for the previous 26 years, and some further particulars have been given concerning other features in the meteorology. The reports regarding the staple food of the people are favourable. The crops were generally good, and the existence of any distress even among the poorer classes is noted in only a few of the districts. In only one of them, the district of Wardha, did the population seem to have been much affected. There the Civil Surgeon reports that "the crops of 1891 had been a failure, and great distress "prevailed among the poorer classes, who had to consume blackened jawar and roots of wild "plants."

3. *Births.*—In Annual Form No. 1. the births are now shown separately for each registering circle, and the composition of the population according to sex has been added. These are valuable improvements on the old form, by which the data can be examined in detail, and attention drawn to any seeming neglect. In the Central Provinces there are 232 registering circles, of which 72 represent town and the remainder rural areas. Taken by districts the birth-rates, as the Sanitary Commissioner observes, vary between a maximum of 45 per 1,000 in Chhindwara and a minimum of 34 in Burhanpur; but district averages are composed of very varying details, and it is only by carefully scrutinizing these details, such as this Form No. I. furnishes the means of doing, that proper check can be exercised over the birth registration. In the registering circles of Chhindwara, for example, the rates range between 36 and 50, and in those of Burhanpur between 31 and 43. Throughout the whole of the circles, omitting cantonments, where the circumstances are always exceptional, the extremes seem to be 70 at Narsinghpur and 16 at Sambalpur. Uniformty is not to be expected in birth-rates, but extremely high or extremely low ratios call for some report. The proportion of males to females born is another matter in regard to which it is very difficult to obtain

accurate returns. According to the details here given this proportion varied between 84 and 191 per cent., but, as in many other statistics, the errors on one side seem to a large extent to be compensated by errors on the other side, and the general result for the Central Provinces is that among the children born in 1892 106·95 were males for every 100 females born, which seems to be an approximation to the truth.

4. *Deaths, and Measures for improving Registration.*—As already remarked, the slight increase in the mortality of the province, 34·14, compared with 32·98 in 1891, was accounted for, and indeed much more than accounted for, by the severe epidemic of cholera in certain districts, and more especially in Raipur, Balaspur and Sambalpur, which lie together in the south-east, and form the Mahanadi Division. It is worthy of notice that although the deaths from cholera throughout the province as a whole rose from 21,312 in 1891 to 39,972 in 1892, many of the districts suffered less from cholera than they had done in the year previous. The fact is of importance in connection with the causes to which the cholera mortality of 1892 has been ascribed, and to which reference will be made in a subsequent paragraph. Speaking of the relative mortality from all causes in the two years, the Sanitary Commissioner remarks that "there is a decrease in the number of deaths in 13 districts, " and this is chiefly due to the slighter prevalence of cholera in those in 1892 compared with the " previous year." The highest district rate of mortality recorded is 46·66 in Raipur, but in one of the towns of that district it equalled 62·10. We have nothing to add to the remarks we made in commenting on the Sanitary Report of the Central Provinces for 1891 as to the measures which may be taken for improving the registration, and as to the fuller information on this important point, which should be furnished in future reports. From the resolution of the Chief Commissioner at the commencement of the volume we learn that the agency of the Native Superintendents of vaccination had been introduced to test the correctness of the police returns, and that the results of the system will be reported in due course.

5. *History of the Chief Diseases. Cholera.*—The history of the cholera of the Central Provinces during 1892 is of much interest, and opens up many of those much vexed and difficult questions which have so long engaged attention. We have already referred to two of the main facts in this history, *first*, that the epidemic was severe and the consequent mortality heavy, especially when compared with the year previous, and, *secondly*, that in spite of this increased severity in the province, as a whole, many of the districts suffered less than in 1891. To be exact on this point, of the 20 districts 10 suffered more and 10 suffered less, with the general result that the total number of deaths increased from 21,312 to 39,972. Great as this difference is, it is but slight when compared with the differences that are to be found in other years. The statistics of ten years are given at page 33, and they show that, while in 1884 the total deaths from cholera in the province amounted to only 149, in 1889 they amounted to 52,588. How are such marked extremes to be explained? The question arises every time that an epidemic takes place, and here, in connexion with the epidemic of 1892, we have a very common attempt at explanation. The disease, it is said, in nearly every district was brought and disseminated by pilgrims and other travellers. It may well be questioned whether such differences in the public health as those above noted can be due to what must be classed under the general head of accident. Great results, especially when they affect large areas of country, can be produced by great causes. The doctrine of importation and dissemination by means of pilgrims is so easy that it meets with ready acceptance, and the facts on which it is based are frequently not examined so carefully as they ought to be. In regard to the Central Provinces cholera of 1892, for example, great importance is attached to the Magh Mela fair at Allahabad as a centre from which the epidemic in the early part of the year began, but, on turning to the Annual Report of the Sanitary Commissioner of the North-West Provinces for information regarding this fair we find that there was no cholera at all at it. He says, distinctly, " There was no indication of cholera at the Magh Mela at Allahabad, and only three " deaths from the disease were returned from the whole district in January." Pilgrims coming from the fair, doubtless, were attacked with cholera in the Central Provinces and elsewhere, not, so far as evidence goes because of the fair, but because they were persons undergoing more than ordinary privation and fatigue, and therefore more subject to attack than they otherwise would have been.

6. *Difficulty of obtaining exact Information.*—On the question of origin the Sanitary Commissioner is very decided. He says, "The introduction of first cases in the persons of pilgrims from infected places, and the spread of disease in their villages, is undoubted." We should like to have had the evidence on which this statement is made more fully given. There is nothing more difficult to ascertain than the occurrence of first cases of cholera. In Europe, now-a-days, the results of microscopic investigation are considered essential before this question can be answered, and although we by no means agree with this opinion, there can be no doubt that very careful investigation is necessary. In India particularly such an investigation is beset with difficulties. The point is well illustrated by the Sanitary Commissioner's remarks on the district reports, nearly all favouring the idea of importation to which we have already referred. He says: " The dates of first cases given by the Civil " Surgeons were the result of special inquiries, and do not agree with those of the police returns " which were submitted as reported to them in the first instance." An inquiry made in this way, necessarily some time after the events have happened to which it relates, promises little accuracy. Even in well-defined communities, such as jails and regiments which are under complete control, and where every sick person is under careful observation, it is often extremely difficult to say when the first case of an outbreak occurred, and it is quite hopeless to expect such exact information from Indian villagers.

7. *Practical Action should be directed to Places and not to Persons.*—The question of importation is not one merely for theoretical discussion. It has the most practical application, for it involves the

action which ought to be taken. Is cholera to be diminished, and perhaps altogether eradicated, by measures taken against the sick,—by isolation and disinfection—or is this most desirable result to be attained by improvement of the localities in which the people live? Whatever may be said in regard to other countries, and on that question there is no occasion to enter, there cannot be the smallest doubt that in India it must be by the improvement of localities that any decided results can be hoped for. In the Central Provinces, as elsewhere, the local insanitary conditions favouring cholera and other diseases, as the Sanitary Commissioner expresses it, "are only too patent. The village sites are filth-"sodden from promiscuous defæcation, cesspits, and collections of manure and rubbish." As regards water-supply, "in the tank districts the gathering grounds and the banks of the bunds are polluted, "and bathing, washing, and watering cattle are carried on. Where wells are used their bad structure "allows entrance of surface pollution, and bathing and washing are done at them. Where streams "are used the beds and ravines are the favourite resorts for the purposes of nature. These are the "ordinary and ancient customs of the people, and they see no harm in them" The districts which mainly depend for their water on tanks seem to be considered more liable to cholera, because of the impurities which are washed into them and the experience of 1892 favours this view. At the same time it is to be observed that the experience of 1891 told in the opposite direction, and the tank districts suffered from cholera much less than other parts of the province. There can be no question that the stress which the resolution of the Chief Commissioner lays on the importance of improving the water supply in all parts of the province is all in the direction of most important practical work, from which the best results may be anticipated in the improved health of the people and their greater freedom from epidemics.

8. *Smallpox and Vaccination.*—Although more numerous than in the previous year, the deaths from small-pox equalled only 995 out of a population of 9½ millions, or ·10 yer 1,000. These results are favourable and speak well for the work of vaccination. It is worthy of notice that the total cases which occurred were not the representatives of severe local outbreaks. They were spread over 17 out of the 20 districts of the province. The highest death-rate in any one locality was 1·20, in the town of Mohari. The separate account of vaccination in these provinces is the prescribed triennial report, in which the work is examined in greater detail than in the reports for the intervening two years, and the results of 1892–93 are compared with those of 1890–91 and of 1891–92. The figures have been examined by the Sanitary Commissioner, and the important points have also been noted in the orders of the Chief Commissioner. Although falling short in some respect of those of former years, the general outcome as regards the number of operations, the percentage of success, and the proportion which the vaccinations among infants bear to the general total, show that the staff had been active and energetic in their duty. These are matters of administrative detail into which we need not enter. The facts at which we wish to arrive are those which afford evidence as to the relation between the vaccination returns and the mortality registered from small-pox over a series of years, and we are glad to see that a suggestion on this subject in our Memorandum on the Central Provinces Report for 1890 has been acted on, and a table embodying this information is given at page 7. The small-pox deaths recorded during the eight years here tabulated stand thus:—

1885–86	2,808
1886–87	2,906
1887–88	4,165
1888–89	16,923
1889–90	10,712
1890–91	1,640
1891–92	627
1892–93	1,098

The figures do not altogether agree with those in the Annual Sanitary Reports, but this we conclude has resulted from the deaths being re-arranged, so that they include the vaccination year instead of the calendar year. However this may be, the small-pox deaths above given are those entered in the table to which we refer, and they represent very remarkable fluctuations. During the eight years concerned they range between 627 and 16,923. As the Chief Commissioner observes, the data concerning vaccination in connection with this mortality afford a certain amount of evidence in favour of vaccination, but it is very desirable that the facts year by year should be carefully analysed by the Sanitary Commissioner, and not merely presented in a tabular statement as they have been in this Report, without any comment. There is abundant evidence in other countries of the vast benefit which vaccination has conferred on the people by diminishing small-pox in the most marked degree, and there can be no more successful method of eradicating local prejudices and opposition against it than by showing over a series of years what advantages the inhabitants of the province have derived from it. There ought to be no difficulty in doing this, considering the vast strides which vaccination has made. In 1867, according to Statement IV., the total number of persons successfully vaccinated in the Central Provinces was only 15,060. With rapid and almost uninterrupted annual increases the number in 1893 stood at 396,469.

9. *Other causes of Mortality.*—In regard to fevers and the other causes of deaths which are distinguished in the returns, there is little to be said in addition to the remarks already made in the Report. Fevers alone account for 188,017, or more than one-half of the whole. The proportion which they contributed varies, however, greatly in different districts, from a minimum of 9 per 1,000 in Betul to a maximum of 31 in Nimar. In the greater detail which is furnished by Table VI. the extremes are more marked still, and range between three in one place and 40 in another. It would appear

as if the difference may be at least in some measure due to differences in the mode of registration, for in many instances where the fever death-rate is heavy the death-rate recorded under "all other causes" is light. In the above-quoted instances, for example, we find that Betul, with a mortality of only nine under *Fevers* recorded 14 under *all other causes*, while Nimar with 31 under *Fevers* recorded only four under *all other causes*. Although these figures are doubtless far from accurate, there can be no question as to the general truth of the fact they convey, that malarial fevers, with all their attendant complications, are a very large item in the diseases from which the people suffer, and that this item varies greatly in extent in different places and in different years. Of 12,619 deaths investigated by the Civil Surgeons during the year, 5,662 are attributed to *Fevers* or 44·87 per cent., while the police inquiry into 28,050 deaths yielded a percentage of 54·68 due to fevers, though, as we remarked regarding a similar statement in the Report for 1891, it is not easy to understand how such an inquiry could be carried out by the police. It seems doubtful if even by the Civil Surgeons the facts gathered, as they apparently were after death, could be elicited with sufficient accuracy to make the statistics of much value.

10. *Diseases in relation to Local Causes.*—In Section IX. of the Report a tabular statement is given which contains much useful information, and which should prove of great practical value in sanitary administration. It shows for 270 different places, classed as either municipalities or thanas, the population, the death-rate, the existing state of things as respects drainage, water supply, and conservancy, and the measures which have been taken to remedy evils in each locality. Under some of these heads more definite information is desirable, so that any defects existing may receive prominent notice. In many of them it is not difficult to connect sickness and insanitary conditions. In Nawaigaon circle of the Bhandara district, for example, with a mortality of 51·77 per 1,000, the drainage is described as "bad," the water-supply as "bad," and the conservancy as "indifferent." In an appendix Dr. Center has given a separate note on the defects of the water-supply over the Central Provinces generally, and has suggested simple means of remedying them which are well worthy of adoption, and we entirely agree with him and with the Chief Commissioner, who has expressed his approval of them, that great advantage would accrue to the public health if they were carried out. The dangers which surround the water-supply both of wells and tanks are great, and yet they seem to be capable of being averted by simple means involving no great expense. The authorities are fully alive to the importance of these improvements. They involve a certain amount of co-operation on the part of the people themselves, and this it may be difficult to obtain from the older generation. With the spread of education and the special instruction which is given in sanitation by the schools more rapid progress may be expected in the future.

11. *Sanitary Improvements effected.*—Considering all the difficulties that have to be encountered, it is gratifying to find that so much has been already accomplished. The work of the year includes the completion of the water-supply for the town of Raipur, some progress in waterworks for Rajnandgaon and Burhanpur, and the laying of a second main from the reservoir to the pumping-station at Nagpur; a survey had also been made for waterworks at Harda. As regards drainage, surveys had been made for the towns of Jubbulpore, Nagpur, Saugor, Bilaspur, and Sambalpur, and "it is hoped that a competent engineer will be soon available to elaborate schemes for the more "important towns in which the necessity for a proper drainage scheme has long been felt." As we remarked last year, the importance of having good engineering advice in all these matters cannot be over estimated. Not only is it essential for efficiency, but it is indispensable for the economical expenditure of the funds available. Nothing could well be more unfortunate for the future of sanitary progress than the execution of ill-devised works which, after costing a large sum of money, nevertheless proved a failure. The minor improvements of the year were carried out under the direction of the Sanitary Board, and consisted chiefly in the construction of new wells and the improvements of others.

12. *The Operations of the Sanitary Board.*—The Sanitary Board has been further strengthened by the addition of the Chairman of the District Council as a member. It is hoped that by this means advantage may be taken of Native opinion, and influential Natives led to take interest in the work. The Board was to a large extent occupied during the year in carrying out the scheme of rural sanitation which was described in the Report for 1891. Fifteen meetings of the Board were held during the year. In accordance with the scheme maps were prepared to show the new sanitary units, containing about 30 villages in each. The population of the province is essentially rural. Only 6·9 per cent. of the people live in towns, and many of these so-called towns are nothing more than overgrown villages. The operations of the Board are, therefore, in the main directed towards the improvement of the villages. Four Assistant Surgeons have been appointed as Sanitary Inspectors, one to each division, and the sum of Rs. 50,000, available for the year's work, was equally divided according to these divisions. With the amount contributed from local sources, and with that represented by village labour, it was expected that work to the value of Rs. 2,00,000 would be executed during the year. Although this programme was not fully carried out, an excellent commencement was made. The particulars, which are contained in the summary of the Board's proceedings (Appendix I.), show what was done in each district, the amount available from the provincial allotment, the estimated cost of the improvements proposed, and the approximate expenditure actually incurred up to the end of the financial year. The primary operation arrived at is the improvement of the village water-supply, which the Board regard as "out of all proportion to other things of "the greatest importance." After that come the cleansing of village sites, cleaning out of drains, removal of filth, filling in of excavations, and demarcation of latrine grounds. The scheme, so far, deals only with selected groups of villages "but it is expected that, on the system of self-help and

"grant-in-aid devised by the Chief Commissioner, the operations will be gradually extended over "great areas, and that it will come to be recognised by district authorities that sanitary works, such "as have been initiated, are as important and necessary for the good of the people as roads and "bridges."

8th June 1894.

No. 7.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of ASSAM for the year 1892.

1. *Measures taken for the Improvement of Registration.*—The improvement of the vital statistics of Assam has continued to engage the attention of the authorities, and the results of another year show how far their endeavours have been attended with success. The figures for 1892 have been carefully analysed by the Sanitary Commissioner, and he has pointed out the more marked defects. The ratios are all based on the Census of 1891, but although the population, as then enumerated, has been employed in two Reports as the groundwork of all the calculations, there has been no attempt, such as we have suggested should be made, to show how far the census totals in towns and districts accorded with the populations which would have existed had the births and deaths—the gains and losses—registered during the preceding years been an accurate record of the facts. It appears that in Assam two agencies are employed for registering the vital statistics. In the Surma Valley and Goalpara it is the rural police, while in all the other parts of the province it is the unpaid village gaonbura. It is not surprising that the data collected by the first of these are as a whole much more accurate than those collected by the illiterate gaonbura, and it is very desirable, as recommended by the Sanitary Commissioner that, if possible, some means should be found of remunerating the gaonbura, and then gradually confiding the work to a more intelligent class with some little education, such as would enable them to keep with accuracy the simple records required. The registers under recent orders are tested by the police officers and also by the inspectors of vaccination on their tours, but it does not appear what was the result of such inspections. A few examples of the facts ascertained by examination on the spot, as compared with what was recorded in the register, would add interest to the Annual Sanitary Report, and at the same time afford ground for judging of what was going on in this matter all over the province. We note that a set of rules with a view to improve the vital statistics had been submitted by the Commissioner of the Assam Valley districts, and that these were being considered by the Chief Commissioner. When finally determined on we would suggest their being printed in full as an Appendix to the Annual Sanitary Report.

2. *Registration of Births.*—There is reason to believe that the care bestowed on the subject and the repeated orders to the local authorities have caused greater attention to be paid to registration, and that the facts are more accurately recorded than they were in former years. The returns for 1892 have been fully examined and commented on, both by the Sanitary Commissioner and also by the Chief Commissioner, and it is not necessary to do more than draw attention to a few of the more important points. The details of birth registration are shown more fully in Annual Form No I. than they have been previously. They now appear according to registration circles and not merely by districts, and valuable information is thereby given; but we observe that a considerable change has been made in the mode of showing the circles. In 1891, according to Annual Form No. VII. and others dealing with the incidence of particular diseases, the number of registration circles in Assam was put down as 632, whereas in Form No. I. of this Report the number is only 77. It appears from the orders of the Chief Commissioner that it was determined in November 1892 that "the units of registration circles "in each district should be,—

"(*a.*) Each town, sadr or sub-divisional, including cantonments, where such exist.
"(*b.*) Each thana, including outposts.
"(*c.*) All the tea gardens taken together in each district."

It is not clear whether these changes have been made merely for convenience in preparing Forms Nos. I. and II. in which it would not be possible to include 632 entries within small limits or whether the division of each district into registration circles has really been altered in the manner indicated, thenumber of such circles in Sibsagar, for example, being reduced from 159 to 8; Lakhimpur from 108 to 6; Cachar from 15 to 7, and so on with the other districts. If the old number of registration circles remains, as we conclude it does, we would suggest that the comparison of maximum and minimum birth and death rates—the point in connection with which the new arrangement is mentioned—should be shown according to them and not according to the consolidated areas, which for convenience are now given in Form I. The comparison between the results attained even in these fewer and therefore larger portions of each district brings out some remarkable ratios. As regards births the ratios vary between 6 and 45 per 1,000, and these two provincial extremes are found in the same district, Goalpara, where, as already mentioned, the registration is believed to be carried on with greater accuracy that in many other parts of the province. In looking at the minimum of 6, it is however necessary to bear it in mind that the proportion of women at the particular place indicated was very small and the same remark holds good of other circles which return a very low ratio, showing how necessary it is in considering the statistics of births to have regard to the proportion of the sexes

With all its inaccuracies there is evidence that in Assam the registration of births is making progress towards greater accuracy. The provincial ratio for 1892 (31·05 per 1,000) although nominally not quite so high as that of 1888 (31·62) was in reality higher, as the population on which the ratio for 1892 was worked was nearer the reality than that on which the ratio for 1888 was calculated. The latter was based on the Census of 1881, or seven years after that census was taken, whereas the ratio for 1892 was based on the census of only the year previous.

3. *Registration of Deaths.*—The average death-rate of the province, 34·2, shows an increase of 4·30 per 1,000 on that of 1891, and is higher than that of any of the other years quoted. It exceeded the birth-rate by 3·16 per 1,000. An examination of columns 7 and 8 in Form No. I., in which the births and deaths are compared side by side, shows that this general result for the province as a whole is made up of very varying details. In 23 of the 77 units adopted in that form the births exceeded the death but in the remaining 54 units the deaths exceeded the births. The highest birth excess is 12·58 per 1,000, but the excess of deaths in many places is much greater than this, and in some reaches even more than 50 per 1,000. These abnormal figures may be explicable in certain areas by excessive sickness and mortality, but an examination of the figures rather points to defects in the registration, especially in the towns, and more particularly to neglected registration of births. Annual form No. II. has been prepared on the same system as that already referred to as having been followed in the preparation of No. I. The registration circles have been grouped according to the same 77 units, and the maximum and minimum death-rate for each district is tabulated in paragraph 9 of the report. The extremes, as the Sanitary Commissioner observes, are very remarkable and suggest the necessity for local inquiry as regards several of them. If we are right in concluding that the areas adopted in Forms I and II., are merely those which it has been found convenient to frame for the purpose of filling in these forms, and the old registration circles remain as before, we would suggest that without disturbing this arrangement the Sanitary Commission analysis and comparison of extremes in each district might with advantage be based on the returns from the original circles, and not on those of the amalgamated areas which appear in these forms. The more localized the investigation of vital statistics is the more practically useful it is calculated to be, both as respects births and deaths, always provided that the population included in the area is sufficient basis for calculation.

4. *Causes of Death.*—Before considering the history of the chief diseases in the Province of Assam during 1892, we may glance at the mortality recorded under the various headings. The results stand thus:—

Causes of Death.	Number of Deaths.		Ratio per 1,000 in 1892.
	1891.	1892.	
Cholera	23,882	21,552	4·29
Small-pox	2,361	1,452	·29
Fevers	75,965	93,971	18·72
Dysentery and Diarrhœa	14,418	15,685	3·12
Injuries	1,597	2,016	·40
Other causes	31,933	37,108	7·39
Total	150,156	171,784	34·21

The increased mortality of the year to which reference has been already made is chiefly ascribed to "fevers" and "other causes." Under both cholera and small-pox there was some diminution. For the higher general death-rate recorded, the Sanitary Commissioner believes that several causes conspired. Some part is to be credited to improved registration, some to an increase of fevers in certain districts, and some again to an increase of *kala-azar* in others. When we come to inquire what general conditions were at work in order, if possible, to explain the greater sickness of the year, we learn that the rainfall in certain districts was unusually heavy. In paragraph 70 an interesting table is given to compare the deaths in the three districts of Cachar, Goalpara, and Sibsagar during a series of years with the meteorological phenomena, and also the price of the chief articles of food in each of them; but although the facts point to a decided connection between a small rainfall, low temperature, and cheap provisions on the one hand, and improved health of the population on the other, they are by no means uniform. For such an inquiry accurate data are indispensable, and the registration of deaths in Assam, especially during the earlier years, was too imperfect to be of much value, even if the other information given could be entirely depended on. It is very desirable that under all the heads to which this inquiry relates, an effort should be made year by year to collect and collate the main facts with accuracy. In a former memorandum we suggested that some account of the emigration which takes place into Assam every year would form an interesting item in the Annual Sanitary Report, more especially as so much of the epidemic sickness which has prevailed in the province has been attributed to importation by labourers coming to work in the tea gardens, and we still think that this idea might be acted on with advantage.

5. *History of the Chief Diseases: Cholera.*—Although cholera was less prevalent during 1892 than it was in 1891, and accounted for 2,330 fewer deaths than in that year, it was still more severe than usual, and, indeed, caused a greater annual mortality than it had since 1884. The facts regarding its distribution and incidence are tabulated for each district during every month of the

year. The general average death-rate from this cause is made up by district averages varying between 1·76 in Goalpara and 7·39 in the neighbouring district of Kamrup. In every month many cholera deaths were reported, and with the single exception of the Khasi and Jaintia hills, where three of the months are blank, no month in any of the districts was ever entirely free from it during the year. The smallest monthly provincial total was 721 in January, and the largest 2,743 in December, and yet out of 13,624 villages in the province, only 2,461 recorded deaths from the disease. With such a history of widespread persistence, and yet at the same time of remarkable isolation, it would be very difficult to fit in any theory of importation to account for the disease, and the Sanitary Commissioner is careful to disclaim any such purpose. We would merely suggest, as an important addition to the facts he has collated on the subject of cholera, that some account should be given of the localities most severely affected. This is no doubt to be found, to a certain extent, in the tabular statement, Appendix C., where the condition of each place as regards water-supply, drainage, and other sanitary requisites is described in relation to its total general mortality, but it is desirable that such conditions should be specially examined in immediate connection with the proportion of this mortality which was due to cholera. Great hopes are expressed that the substitution of wells for tanks may in time prove a valuable defence against cholera, but it must be remembered that severe epidemics of this disease have frequently occurred among people whose sole supply of water was derived from wells.

6. *Small-pox and Vaccination.*—It is satisfactory to find that the deaths from small pox in 1892 numbered only 1,452, or the equivalent of ·29 per 1,000 of the population. This, it is said, is a smaller death-rate than that of any year since 1879, but, according to the table given in paragraph 12 of the Vaccination Report, the number of deaths from small-pox in 1886 was only 564, which, making every allowance for changes in population, must represent a considerably lower ratio than that recorded for 1892. The most noticeable features in the distribution of the small-pox mortality are the high rate for the district of Kamrup (1·62) and the immunity of Nowgong, where, among a population of 344,141, not a single death from small-pox was recorded. Of the total of 1,452 deaths from small-pox which were registered thoughout the province during the year, 229 occurred in infants under one year and 869 in children under 12. The separate Report on vaccination during 1892-93 shows that considerable progress was made during that year. The number of operations performed represents a substantial increase, the percentage of success was high, and the proportion of infants protected shows a considerable advance on the work of former years. The total number of infants vaccinated with success amounted to 41,920 (38,878 by the special Department and 3,042 by the Dispensary staff), while the number of births registered during 1892 was 155,909. We are glad to learn that "the percentage of successful primary "vaccinations among infants under one year of age to the total number of births registered was "26·89 in 1892–93, as compared with 15·50 in 1891–92 and 11·69 in 1890–91, exhibiting a "considerable increase in favour of the past year." Evidence that the wider spread of vaccination in Assam has been attended with a diminution of small-pox is furnished in paragraph 13 of the Vaccination Report and the tabular statement which precedes it, the general result being that the annual average number of deaths from small-pox during three successive quinquennial periods, commencing with 1877, stood thus—1,812, 3,336, and 1,846, while, as already stated, the figure for 1892 was 1,452. The results show great fluctuations, especially when they are taken by each year separately. In the first period they vary from 1,014 to 3,129; in the second period from 564 to 6,162; and in the third from 1,401 to 2,361. So far there is no doubt general evidence of improvement, but it would be more satisfactory if, instead of taking the province as a whole, the vaccinations and small-pox deaths were compared district by district.

7. *Fevers, Beri-Beri, and Kala-Azar.*—The general question of the prevalence of fevers is so mixed up in Assam with discussions regarding beri-beri and kala-azar that they may all three be conveniently considered together. The general statistics for fevers for 1892 are very unfavourable. The mortality under this head equalled 18·72 per 1,000, while that of 1891 had been only 15·13, and this again was an advance on 13·88, the average of the previous five years. Taken by districts the fever deaths were 29 per 1,000 in Goalpara, 26 in Kamrup, 24 in Darrang, 21 in Nowgong, and under 19 in each of the others. The increase in the fever deaths is ascribed in part to improved registration and in part to an actual rise in the number of deaths due to the heavier rainfall and to outbreaks of *kala-azar* in certain places. But, so far as can be gathered from the statistics and other information contained in the report, any rise in the mortality from this last cause in certain districts had been more than balanced by a reduction in others, so that the total deaths ascribed to kala-azar throughout Assam in 1892 were only 6,734, compared with 9,937 in 1891. The disease was reported to be rapidly decreasing in the districts of Kamrup and Goalpara, but increasing in Nowgong and Darrang. We fear, however, that little dependence can be placed on these figures, and that the recognition of kala-azar as a special disease, if it is really a special disease at all, is beyond the powers of the agents on whom the duty of reporting necessarily devolves. In particular, the line to be drawn between kala-azar and beri-beri is by no means well ascertained, while both would seem to be easily mixed up with severe cases of ordinary malarious fevers. The presence of a particular parasite, the *dochmius duodenalis* or *anchylostomum duodenale*, has been claimed as the distinguishing feature of kala-azar, but, as we remarked in noting on the report for 1891, it would seem that "too much impor-"tance has been attached to the parasite, that its presence has been too hastily assumed to be the "*cause* of the disease whereas it may yet be proved to be a consequence or merely an accompaniment "of it." Of the correctness of these views we have striking confirmation in the researches which were conducted by Surgeon-Major E. Dobson, Civil Surgeon of Dhubri, and an account of which is given in Appendix D. After examining healthy coolies and those rejected for different causes, as well as

a variety of other persons, such as servants, prisoners, and patients in the dispensaries, the results were that the parasite was found in 454 out of 547 persons apparently in excellent health, and in many of these in great numbers, while in not a few of the cases of kala-azar examined it was not found at all. The practical outcome of the whole discussion would seem to be what we suggested in our remarks on the Assam Report for 1891, that the best method of dealing with this question does not consist in attempts directed to prevent the importation of the parasite, which, even if it were beyond all doubt the cause of the disease, could never be successful, but in the improvement of local conditions under which the people live.

8. *Sanitary Defects.*—Appendix C. gives some account of the drainage, water supply and conservancy of 27 municipalities and thanas throughout the province, and under all heads defects are noted. But the most striking evidence of the urgent want of reform is to be found in the column of this tabular statement which gives the death-rate, especially when it is borne in mind that the deaths are under rather than over stated, and that in many of the towns the record in this respect falls far short of the actual facts. Of the 23 places entered in the statement there are 18 in which the mortality exceeded 30 per 1,000, and of these, again, five return a death-rate of over 50 per 1,000. In the town of Tezpur the maximum is reached of 80·78. The population here is small, only 4,011, and considerable fluctuations are therefore to be expected in the results year by year, but it is remarkable that in this town, with such a very high death-rate, no mention is made of any sanitary defects at all. On turning to Annual Form No. VI., we find that the deaths were in great measure due to cholera and dysentery and diarrhœa. When disease prevails, and especially when this is indicated by a heavy death-rate, it is important that the local causes should be searched out with a view, if possible, to their removal.

9. *Sanitary Improvements.*—A separate column of Appendix C. is devoted to showing the "measures taken to remedy the evils in each locality" and further information as to what was done in each municipality, town, and union of the province is given in Section IX. of the report. No great work was either commenced or completed during the year. In Assam, as in other provinces, the want of funds has proved a great obstacle to the construction of such works, but the information furnished by the Sanitary Commissioner regarding individual places, many of which were visited by him during his tour, and also the general conclusions which are summarised in the orders of the Chief Commissioner, show that the important question of sanitation engages much attention. Some progress has been made in minor sanitary improvements. The income of local bodies had increased somewhat during the year, and the proportion of that income which was spent on such improvements had also increased. As regards villages which are not included in the last remark, it is observed that the limited income of the Local Boards under which they are in this respect administered has been judiciously expended, that an addition has been made to the income of these Local Boards, and "with these extra funds at their disposal the Chief Commissioner expects that every local "Board will increase its annual expenditure on sanitary works, and more especially in the direction "of supplying good wells to every large village as well as to every important *hât* (market) held outside "municipal limits."

10. *Sanitary Board.*—No change was made during the year in the constitution of the Provincial Sanitary Board, but it was decided that instead of formal meetings for the transaction of business the papers should be circulated among the members. The endeavours of the Board seem to have been mainly devoted to the improvement of the water-supply, drainage, and conservancy of villages, and in the summary of work done in the different districts mention is made of the sums expended on such objects; but the actual progress made has not been great. As already mentioned, it was hoped that more may be accomplished in future years.

8th June 1894.

No. 8.

Memorandum by the Army Sanitary Commission on the Rajputana Sanitary Vaccination Dispensary and Jail Report for 1892.

1. *History of a Disastrous Year.*—This is the history of a very trying year for Rajputana in which there were great sickness and suffering among the people, and the officials were called on to make unusual exertions to prevent starvation in many parts of the country, not only within British territory, but also in some of the Native States. In three of these—Marwar, Bikanir, and Kishengarh—as well as in Ajmere and Merwara, scarcity approaching to famine existed, and it was necessary to organise relief works in many places, with hospitals and medical attendance, while at the same time a general medical supervision was exercised over the health of the people, to watch their condition and to determine how far relief and attendance were really required. All the arrangements seem to have been very successfully conducted, and although it was not possible to obviate the evil effects of scarcity there was no death actually due to starvation. The causes of the distress were very plain. The rains of 1890 and again of 1891 had failed to a degree almost before unknown, and it was not till after the rain of 1892 fell, as it fortunately did in abundance, that the wants of the people were fully met. Cholera, smallpox, fevers of a virulent type, and, in fact, all manner of diseases, were more than ordinarily prevalent, and it is not to be wondered at that under these

circumstances the statistics of 1892 show a considerable falling off in the birth-rate and a death-rate double that of the year previous.

2. *Vital Statistics: Births.*—We need not further enlarge on the great facts of the year which are already very clearly narrated in this Report and summarized in the introductory note by the Agent to the Governor-General for Rajputana, but we may draw attention again to the great imperfections which still characterize the statistics of both births and deaths. In Annual Form No. 1 the births shown in detail for the 23 circles into which the Ajmere and Merwara districts, which comprise the part of Rajputana directly under British rule are divided, the rate varies between 6·73 in one, and 78·83 in another. In Ajmere town it equalled only 13·49, while in Ajmere suburbs it reached the maximum of 78·83 above noted. The general average for these districts, 15·61, must be far under the truth even in a year of distress, for a diminished birth-rate rather follows than is coincident with this state of things. The disproportion between the male and female births is a further evidence of inaccuracy. The general ratio of 128 males born to every 100 females is not to be credited, especially as the average for the two districts is composed of items ranging between 97·10 males to every 100 females in one circle to 170 males to every 100 females in another. With such unsatisfactory results within British territory it is not surprising that the returns of births in the Native States should be equally untrustworthy. In the 21 separate places within these States which are tabulated on page 12 the births vary between 3·12 and 71·98 per 1,000. Nothing is said of the means taken to improve the registration, and yet this is a point of great importance which ought to engage the attention of the authorities.

3. *Deaths.*—The record of deaths during 1892 also bears evidence of equal neglect. The death-rate in Ajmere-Merwara rose from 20·23 in 1891 to 40·80 in 1892, an increase which, considering all the circumstances, is by no means improbable. It was also to be expected that the rate in different circles would greatly fluctuate, but without some explanation it is difficult to accept the extreme rates as accurate, more especially when they are recorded opposite places which are close together. Here we have Ajmere suburb again figuring in remarkable contrast to other circles, and particularly to Ajmere town. In the one circle the mortality is 137·42, in the other it is 24·86. In the suburbs, moreover, the female death-rate is 189·50 compared with 112·56 among males. In these suburbs also, we see that no less than 39 deaths are ascribed to wounding and accident, the rate under this head equalling 14·81, while the next highest is only 1·01, and none of the others amount to 1. In the Native States it is sufficient to note death-rates ranging between 4·28 and 54·14. On an average the ratio in the Native States stands at 20·07, or about one-half what is entered for Ajmere-Merwara. In the Native States, as we have previously remarked, progress in registration can hardly be expected until the British portion of Rajputana sets a better example.

4. *History of the Chief Diseases: Cholera.*—In Ajmere-Merwara cholera deaths were not registered till April, and they ceased in August, the total having been 2,352, or 4·34 per 1,000. In the Native States of Bikanir and Dungarpore, the one in the extreme north and the other in the extreme south of Rajputana, cholera was somewhat prevalent in January, and in the former it continued almost uninterruptedly throughout the year. The total number of fatal cases of cholera recorded in the Native States is 24,408, of which the greater portion are returned from Jodhpore, Bikanir, Ulwar, and Dungarpore; but the ratios of mortality per 1,000 of population have not not been worked out for all the Native States, and so it does not appear which of them suffered most severely. In the absence of more accurate statistics it would be fruitless to attempt to follow the history of the disease or to weigh the opinions expressed here and there that the epidemic was due in any measure to pilgrims from Hurdwar. It would be more instructive to know the sanitary condition of the places which suffered from cholera, and particularly of those which suffered most severely. On this point information is much required, but there is no sanitary survey of towns and villages even for those parts of Rajputana which are administered by the Government of India. The first step towards improvement in local conditions is to point out clearly, place by place, the evils which now exist.

5. *Smallpox and Vaccination.*—The only other disease to which we need refer is small-pox. The statistics show an increase under this head from 561 deaths in Ajmere-Merwara in 1891 to 1,652 in 1892, and from 426 in Native States to 1,646 in 21 out of the 35 places for which the numbers are given. Owing to the unusual sickness and distress, vaccination was attended with more than ordinary difficulties, and there was a falling off in the amount of work done both in British territory and Native States. The percentage of success claimed in re-vaccination (87) is somewhat under that of the previous year, but it is sufficiently high to indicate either that the returns are incorrect or that the primary vaccinations in these cases had been unsatisfactory. It would be well if, in Rajputana, and indeed in all the provinces, the Sanitary Report dealt less with the number of vaccinations and re-vaccinations and the number of those returned as successful, and analysed more closely the effect which vaccination was having on the extent of small-pox among the people. This is the only real test of the value of the work done.

6. *Sanitary Progress.*—The circumstances of the year were not favourable to sanitary progress, but one very important work was carried out, and that is the construction of an additional reservoir of water for the supply of Ajmere. This work was referred to in last year's memorandum, but we now have the additional information that it has fulfilled expectation, and proved of great advantage to the city of Ajmere, which for some years had been threatened with a water famine. Some minor improvements are reported both in Ajmere-Merwara, and in some of the Native States. It is noted that in several of the cities considerable attention was being paid to sanitation, and that the improvement of the villages had been taken up by the Ulwar durbar.

7. *Jails.*—It is remarkable that although the year was generally so unhealthy the mortality in the jail of Ajmere was almost the same as it had been in the year previous—27·61 compared with 27·00. The 14 jails of Native States which furnished returns show an increased death-rate—41·70 compared with 33·70. In connexion with any increase of sickness or mortality the only insanitary condition mentioned is over-crowding, an evil which is most apt to occur in a year of scarcity when the number of prisoners increase and they frequently arrive in a state of health which renders any over-crowding specially dangerous.

19th July 1894.

No. 9.

Memorandum by the Army Sanitary Commission on the Medical and Sanitary Report of Coorg for 1892.

1. *Vital Statistics. Careful Analysis of details desirable. Births.*—There is not much in this Report calling for remark. In previous memoranda we have referred to the advantage which would be derived by taking the statistics of the six registration circles into which the province is divided and comparing the details instead of dealing with the population as a whole. Even if such details are not given in the manner we propose for all the annual statements, a more complete analysis of the figures would be of great use, not only in order to test the accuracy of the returns, but also with a view to their practical application. For example, we learn from Annual Form No. I. that the total births registered during 1892 numbered 3,829, or an equivalent of 22·12 per 1,000, but this is merely the average of the province as a whole, and loses much of its value unless the materials of which it is composed are shown. What was the rate in each registration circle, and what range do these rates yield between the maximum and minimum? The birth-rate, although it shows an increase on that of 1891, is very low. This result would seem to be dependent in part on the excess of males in the population, but without a careful examination of the figures circle by circle no conclusion can well be drawn on this or any other point connected with the vital statistics.

2. *Error in mode of calculating Male and Female Births.*—In Annual Form No. I. the ratio of male births per 1,000 of population is entered as 20·35 and that of female births at 24·33. If these ratios were correct then the total birth-rate ought to be 44·68, but it is only 22·12. It would seem that the male birth-rate has been calculated on the male population and the female birth-rate on the female population, which is altogether erroneous. All should be calculated on the total population as the heading of the column indicates. A similar error occurs in the Annual Sanitary Report of Coorg for 1890 and 1891, but it escaped observation.

3. *Deaths. Measures for improving Registration.*—In dealing with the deaths the examination of the details is more important even than in dealing with the births. It is not enough to record that the deaths during the year represented a mortality of 30·62 per 1,000. It is desirable that the circle ratios, from which this average ratio is calculated, should be considered both with the object of inquiring further as regards those places where the nature of the returns leads to the suspicion that there has been some neglect in the registration, and where such inquiry is therefore evidently wanted, and also with a view to what is the practical aim of all such statistics—the careful investigation of places where the mortality has been high and where accordingly there must be local insanitary conditions which ought to be dealt with. In addition to such an analysis of both birth and death returns there is another important means of improving the registration to which we have frequently referred, and that is the inspection of the registers whenever opportunity occurs by officers on their tours, and by the vaccination staff whose own work is so immediately concerned with birth registration on the one hand, as representing the most important material with which they have to do, and with death registration on the other, so far as it relates to deaths from small-pox, the number of which is the only real test of the excellence of vaccination. We are not aware how far the services of officers on tour are available in Coorg for such inspections, but on this and the other points above indicated it is desirable that information should be given in future reports.

4. *History of the Chief Diseases: Cholera.*—The year was very unhealthy, the net result being that the death-rate from all causes was nearly 9 per 1,000 in excess of what it had been during 1891. Cholera, though more prevalent than it had been in that year, contributed only 58 deaths, or a ratio of ·33 per 1,000. The disease was widely distributed. Out of the six taluqs four returned deaths from this cause, but the highest ratio so occasioned was ·94 per 1,000. This we learn from the cholera map. It is worthy of notice also that the whole of the 58 deaths throughout Coorg were returned from 19 villages out of a total of 517. Cholera is reported to have been severe in the neighbouring districts of Mysore and South Canara, and its appearance in Coorg is attributed to importation from these parts. The exact facts on which this opinion is based are not mentioned, but if this be the real explanation it is remarkable that, although the disease showed itself unmistakably in Coorg, by seven deaths in the month of April, the total for the year amounted to only 58, and that the intercourse which must have taken place among the population during nine months after the disease first appeared led to cholera deaths in only 19 out of the 517 villages in the province.

5. *Small-pox and Vaccination.*—Small-pox was much more destructive, and caused 913 deaths during the year, or a mortality of 5·27 per 1 000. In 1891 Coorg showed the highest small-pox

mortality of all the provinces of India, but the ratio on that year (2·75) was little more than half what it amounted to in 1892. This pre-eminence of Coorg in small-pox mortality is the more remarkable because the proportion of the population reported to be protected by successful vaccination is extraordinarily high. In 1891–92 it was set down as 54 per 1,000, the next highest being only 37, in the Central Provinces. In 1892–93 it is given as no less than 63·80. Several of the sanitary reports for the other provinces for 1892 have not yet reached us, so that we cannot as yet make a full comparison of results, but we observe that the proportion entered in the Berar Report is only 37. So far as the work done by the vaccination staff can be judged by the other figures given in this report progress was being made. The number of persons operated on had increased and the percentage of success was high, but the prevalence of small-pox, which is the only real test by which the vaccination work can be tried, is unsatisfactory.

6. *Sanitary Defects and Improvements.*—Fevers and also dysentery and diarrhœa contributed more than ordinarily to the mortality of the year, but no special information is given as to the localisation of these diseases. It is desirable that this should be supplied in future reports, and that side by side with the death-rates, especially where these rates are high, some account should be given of the local defects which seem to be connected with these results. This is now done in the provinces generally in a systematic manner by means of a tabular statement or sanitary survey of towns and villages, and a similar form might be employed for Coorg. We observe that the Civil Surgeon's inspection notes of towns and villages have been forwarded to the Commissioner, and that orders have been issued in regard to the removal of insanitary conditions in some of them. The most important work of improvement mentioned is the provision of water for the town of Merkara, on which Rs. 15,208 were spent during the year, but it does not appear what has actually been done in the matter, or when the supply will be available.

7. *Sanitary Board.*—Five meetings of the Sanitary Board were held during the year, at which various matters were discussed, the more important being proposed rules for the sanitation of villages and rules for the protection of labourers, based so far as applicable on those in force at Assam.

8th June 1894.

No. 10.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of Madras for 1892.

1. *Evidence of Progress.*—We have read this Report with much interest. It is the history of another most unhealthy year, but at the same time contains a record of much excellent work which cannot fail to be very beneficial. The volume as usual consists of distinct reports by the two members of the Provincial Sanitary Board—one by the Sanitary Commissioner, which deals with the statistics of the year, the meteorological and other conditions, and all the other questions prescribed for discussion in Sanitary Reports; and the other by the Sanitary Engineer, which contains information regarding the drainage and water-supply works which had been overtaken or were in progress during the year. This last is a very gratifying record, and sets an example which might be followed with great advantage by other provinces. It would be well that they should all be made fully acquainted with the progress which Madras is making in these important matters, and with the mode of working adopted in that Presidency, as it seems well calculated to obtain the much desired end. It is apt to be lost sight of that the great aim and object of the Sanitary Department in each province is to carry out the work of drainage, water supply, and cleansing, and that success or failure is to be measured by the extent to which this is accomplished. The experience of Madras in 1892 is thus most encouraging, not only because of what has been done there, but also as an example of what we hope may soon be accomplished in every province in India.

2. *The unhealthiness of the Year and its Causes.*—As already mentioned, the year was unhealthy. The number of deaths recorded was much the same as in 1891, being 750,755 in the one and 747,553 in the other. In the report for 1891 the mortality of that year was set down as 26·2 per 1,000, but this ratio was based on the census population of 1881; corrected by the census of 1891 the ratio is reduced to 22·2, while that of 1892 stands at 22·3. The net results of the two years are thus almost identical, the chief differences in details being a considerable diminution in cholera, which, however, still continued severe in certain parts, some increase of small-pox, and a very large increase of fevers. The year was marked by an unusually heavy rainfall, the mean for the province having been 58·43, but there could be no better illustration of the erroneous ideas to be formed from averages, on which we have frequently insisted, for we learn that while the rainfall was above the average in 10 districts it was below the average in 12 others, so that the statement showing increased rainfall for the province as a whole is entirely misleading. This point has been already noticed by the Government of Madras, which has directed that in future the districts should be divided into groups and a mean struck for each group. The prices of food were decidedly high. At pages 8 to 11 a very interesting statement is given showing for every district of the province the mortality, the meteorological conditions, and the prices of the most common grains during 1892, as compared with each of the previous five years. High prices affected all of them. As regards rainfall, the general character of the evidence is decidedly to connect heavy rainfall and increased mortality, and *vice versâ*.

3 *The Census in relation to Registration of Births and Deaths.*—Before considering the vital statistics of 1892, we may glance at the results which the Sanitary Commissioner deduces from the history of the period between the censuses of 1881 and 1891, and the figures which those censuses recorded. We have in several of our Memoranda on the Sanitary Reports suggested that this should be done as a valuable means of checking the registration, and we are glad to see that it has been carried out in this Report. It appears that, according to the censuses, the population of 1891 shows an increase of 15·28 per cent. over that of 1881, whereas the excess of births over deaths, as recorded by registration during the intervening period, amounts to only 7·87. This general result for the whole province is made up of elements varying much in different districts. In both the census and registration returns all the districts show an increase, but the proportion of this increase between the results of the two modes of calculation ranges between ·80 per cent. in one and 14·79 in another. A separate statement constructed on the same principle is given for each of the 48 municipal towns. Here the census increase is 12·49, while the registration increase is 2·21, and the details, if taken separately, indicate very marked differences. The Sanitary Commissioner seems inclined to ascribe some of these to immigration, but there can be little doubt that, as a whole, the evidence points to defective registration as the great cause.

4. *Births.*—This conclusion is fully borne out by the statistics of births in any one year. If we take the figures for 1892, we find the same evidence of defective registration as usual. The general birth-rate of 25·1* per 1,000 is manifestly far under the truth. It is not necessary to examine the details for further evidence of this fact, but when we do look at the results for individual districts and circles such evidence is abundant. In the districts the rate varies between 36 in Madras and 17 in Gangam. In 36 municipalities which are tabulated at page 21 the rate varies between 20 and 41, or, if we take the particulars of the 270 registering circles entered in Form No. I., we have a scale rising from 1·8 to 48 per 1,000. The diagram opposite page 22 shows very graphically how far behind the registration of births in Madras falls short of what it ought to be. Assuming, as there is every reason to believe, that every return of not more than 35 per thousand must be erroneous, there are only 11 registration circles in the whole of Madras which are not neglecting their duty in this matter of birth registration, and many of these to a very large extent. The Government has again called special attention to this matter. Several of the other provinces have been much more successful than Madras in the recording of births. Madras, with only 25 per 1,000, compares ill with 39 in Berar, 38 in the Central Provinces, and even with 34 in Bombay.

5. *Deaths.*—A similar circular diagram to that concerning births is given to illustrate the deaths. Here, as might be expected, the rates vary enormously, and one advantage of the diagram is that it shows very clearly how many of the most marked fluctuations are to be found within the same district. In Kistna, for example, they range from 42 to 17, and although this is an extreme case, there are many others where the differences are sufficiently striking. Taken by districts, the mortality varied between 46 in Madras and 14 in Gangam. Of 55 municipal towns tabulated at page 28, Kurnool heads the list with 55·2 per 1,000, and Parlakimedi is at the foot with 18·2. Among districts after Madras, the next highest is 35·1 in the Kurnool district. In none of the others did the rate amount to 30, and in nine it did not exceed 20 per 1,000. Much of this must be set down to imperfect registration. The general death-rate of the Madras Presidency is suspiciously low compared with that of other provinces. The rate for 1892 (22·3) is lower than that recorded in any other province during that year except Lower Burma where registration is much neglected. In the other provinces it ranged between 32·50 in Bombay and 49·4 in the Punjab, the result of the most unhealthy year ever recorded in that part of India. Another respect in which the mortuary statistics of the Madras Presidency are peculiar is the small variation in the mortality of different years. In other provinces this varies greatly, and we know from the accurate statistics of troops and prisoners that such variations represent the truth, but in Madras during the last six years the difference has been only that between 21·4 and 23·5.

6. *History of the Chief Diseases. Cholera.*—Although the epidemic of 1892 was not so fatal as that of 1891, the number of deaths from cholera recorded during the year was very large (79,033) and the death-rate per 1,000 under this head (2·3) heavy, compared with that of most years in the Madras Presidency. In 1891 the deaths had numbered 98,773, yielding a death-rate of 3·5. This epidemic of 1891 was remarkable for the large number of deaths recorded in December. Of the whole cholera deaths of that year 32,822, or near one quarter, occurred in this one month. In January 1892 the epidemic continued severe, and the number of deaths recorded in that one month was considerably larger than that recorded in any other month of the year. During 1892 nearly every district suffered almost continuously, but in all of them the disease had greatly declined in the last quarter, and in several it had disappeared altogether. The district mortality, however, varied greatly, the maximum having been 6·5 in Godavari, and the minimum ·2 in the neighbouring district of Ganjam. The only district which intervenes is Vizagapatam, and here the cholera death-rate was only 1·7. The conjunction of the two extremes so near one another is remarkable and gives rise to the question, what causes, if any, can be discovered to account for the contrast? In Godavari, the rainfall of 1891 had been decidedly deficient; that of 1892 was much above the average. A similar remark applies to Kurnool, which suffered next in severity to Godavari, the cholera death-rate there having been 6·0. But in Tanjore, which comes third on the list, with a ratio of 4·1, the state of things in respect of rainfall was very different. In 1891 it had been much the same as usual, and in 1892, instead of being excessive,

* In paragraph 14 this is said to be 25·9, but this seems to be a misprint.

as it was in Godavaria and Kurnool, it was deficient. It is not possible to connect cholera prevalence or abeyance in these districts with any known meteorological phenomena. In all three of them high prices for food ruled, but, as already noted, this was a condition common to the whole Presidency. In several instances an explanation is sought for in the supposed introduction of the disease by pilgrims or others, but even if this statement could be entirely depended on, they explain none of the phenomena of the epidemic—neither its prevalence in one part, nor its comparative absence in another, or the extraordinary localization of the disease as represented by the fact that of all the villages throughout the Presidency only 17·5 per cent. returned deaths from cholera, and that the highest percentage in any district was not more than 36. When we remember the continuous presence of cholera in nearly every district throughout the entire year, this result is very remarkable and difficult to reconcile with the incidents purporting to account for the facts by importation. We entirely agree in the observation of the Sanitary Commissioner in summing up the events of the year that "no new light has been "thrown on the etiology of the disease, but there is sufficient evidence to show that insanitary "conditions tend to localise cholera, and that the best way of preventing the origin and spread of "cholera is to remove all local insanitary conditions and carry out the sanitary measures which are "known to be antagonistic to the prevalence of the disease."

7. *Small-pox and Vaccination.*—Of small-pox there were 43,757 fatal cases in 1892. During the previous 20 years the number has fluctuated between 88,321 and 14,529. The figures for both 1891 and 1892 are indicative of greater small-pox activity than there had been for a considerable period. In the year under report the highest small-pox mortality (4·4) was in the Malabar district, and then come 3·5 in Kistna and 3·0 in Godavari. The lowest, 0·06, was in Madras. In Malabar the people are reported to be much opposed to vaccination. In Madras, on the other hand, vaccination is "carried on in a most efficient and satisfactory manner." The results in this town certainly speak well for the protection which vaccination affords. In 1884 small-pox carried off 3,997 persons. In May of that year vaccination was made compulsory, and the annual death-rate from small-pox since then has never exceeded 0·2 per 1,000. The mortality of 19·9 from small-pox in the municipality of Cochin during 1892 presents a noteworthy contrast. More information might be given on the connection between the amount of successful vaccination over a series of years in each district, as compared with the deaths from small-pox during the same period. Statement I. of the Vaccination Report contains some data on this important point, but facts which are presented in tabular statements, without particular attention being drawn to them and to what they teach, are apt to make very little impression. The evidence in favour of vaccination ought to be very clearly set forth, and there ought to be no difficulty in obtaining it, seeing that since 1881 the number of persons successfully vaccinated in the province has risen from 543,093 to 1,049,505 in 1892–93. Such experience as that of Madras town above referred to cannot be too widely made known, as the best means of overcoming prejudices against vaccination.

8. *Fevers.*—The extreme prevalence of fevers in the Madras Presidency is indicated by the facts that the number of deaths recorded under this head in 1892 (280,627) is greatly in excess of that of previous years, and also that in 16 out of the 22 districts the fever mortality was higher than the high ratio of 1891. The district rate varied between a minimum of 2·2 in Tanjore and a maximum of 22·8 in Kurnool. Much of this disparity seems to be due to uncertainty of diagnosis and varied procedure in different places. What is returned as a death from Fever in one place is returned under All Other Causes in another place. If, for example, we take the two extremes of fever mortality above noted, we find that the differences in the ratios under All Other Causes in those two districts are just as marked, but in the inverse direction, and the general effect is to diminish greatly, the discrepancies in either taken separately. The figures for those two districts and two others added to illustrate this same general fact stand thus :—

	Mortality from		Total.
	Fevers.	All other Causes.	
Kurnool	22·7	4·5	27·2
Tanjore	1·9	18·5	20·4
Bellary	10·3	12·4	22·7
Cuddapah	16·3	3·2	20·0

The high fever mortality of 1892 seems undoubtedly to have been largely dependent on heavy rainfall and dear provisions, but with so much uncertainty attending the statistics of fever deaths it would not be safe to take them alone as any guide to the relative prevalence of fevers in different districts.

9. *Local Conditions.*—It is safer to take the death-rate from all causes and compare that with the local conditions as respects drainage, water supply, and conservancy, and that we have the opportunity of doing in the statements containing an abstract of the sanitary reports of municipalities and of those of the local fund circles. In addition, there is a separate sanitary estimate of villages in each of the registration circles, but here the death-rates are not given as they might be with advantage. If we take the municipalities first, there are numerous instances of high death-rates being associated with great sanitary evils. At Anantapur, for example, with a death-rate of 36·3, "cesspools abound." At Ellore, with 31·2, "house sewage flows into cesspools, public drains, or into streets," the water is "bad." In Kurnool (55·2) "about 400 cesspools exist." At Periyakulam, with 38·2, "cesspools

exist," and the river, which is the chief source of water-supply "is subjected to much contamination." We need not multiply examples of this kind in the municipalities, or point out others of a like nature in the local fund and registration circles. The facts are already well known to the authorities, and what is of more importance, they are doing what they can to remedy them. It is very important, however, to keep all the facts concerning insanitary conditions perpetually in view until they have been remedied, and therefore we attach much value to these sanitary surveys, even though they involve repetition from year to year.

10. *Sanitary Improvements by Municipalities and other Local Bodies.*—The improvements carried out by the municipal councils and district boards are described by the Sanitary Commissioner in Section IX. of his Report. They embrace (*a.*) the sinking, cleansing, and repairing of wells; (*b.*) the construction and repair of drains, public latrines, markets, &c., and (*c.*) the improvement of village sites. Statements are given to show how much was expended by each municipality and district board under these various headings, what was their estimated income, and what proportion of this was devoted to sanitation. Full particulars are also given of the conservancy establishments in each municipality, and of the extent of latrine accommodation which has been provided in proportion to the population. The information is full, and arranged in such a way that the Sanitary Commissioner can see at a glance the position of each local authority in respect to sanitary matters. In the municipalities Rs. 15,39,485 were assigned for expenditure on sanitation during the year, besides Rs. 6,31,741 allotted by the district boards. The results generally are gratifying. We have also the assurance of the Sanitary Commissioner that "there is no doubt that progress in sanitary "matters is being made in most municipalities, and that many chairman and municipal councillors "are throughly aware of the close relation that exists between the sickness and mortality from which "the people annually suffer and the insanitary conditions among which they live, and, as far as lies "in their power, do all that is possible with the means at their disposal to remove existing defects, "and adopt measures to protect the public health." We further learn that, even in the villages, which are necessarily the most difficult part of the community to deal with in this respect, improvement is being effected in all districts.

11. *Sanitary Engineer's Report and larger Sanitary Works.*—As already mentioned the separate Report of the Sanitary Engineer deals with the improvements in drainage and water-supply, and it is a very satisfactory and promising record. We can only state generally what has been done during the year. Thirteen towns were surveyed, and levels taken in view of projects for water-supply and drainage, and in seven others preliminary steps were adopted for similar objects. Plans and estimates for such works in six towns were sent in and awaited the sanction of the Government, but it was found necessary to abandon three of these for the present, as being beyond the means of the municipalities concerned. In nine towns works for water-supply and drainage were either in progress or had been completed during the year. In five other towns works having the same object, which had received sanction, awaited the provision of funds for their commencement. The want of funds necessary for great works of improvement is felt in Madras, as it is in every other Indian province. The Sanitary Engineer observes, "The financial difficulty is almost the only real difficulty of the sani-"tarian in India. The difference of habits from European races can be met and provided for, "prejudices against a proper drainage or water-supply have almost disappeared, but the financial "difficulty only grows stronger."

12. *Sanitary Board.*—No change in its constitution has taken place, it is composed as before of two members, the Sanitary Commissioner and the Sanitary Engineer. They exercise a general supervision over the municipalities and district boards, and all estimates for sanitary works, whether original or only for repairs, require their sanction before being put into execution.

8th June 1894.

No. 11.

MEMORANDUM by the ARMY SANITARY COMMISSION on the REPORT of the SANITARY COMMISSIONER of BOMBAY for 1892.

1. *Examination of Statistics.*—As usual the statistics of both births and deaths have been carefully examined in this Report. In the Bombay Presidency there are 285 separate registration circles, of which 56 seem to be towns and the remaining 229 rural tracts. According to the instructions lately issued by the Government of India, all these appear in detail in Forms I. and II., which, we would suggest, might be further improved and made more convenient for comparison and other reference if a serial number were given to the circles throughout, and not merely a serial number for the districts. In addition to analysing these and the other annual forms in his Report, the Sanitary Commissioner deals in detail with individual districts, and for each of them furnishes supplementary tables in which the birth and death rates for every registration circle are compared side by side, as well as the causes to which the deaths are ascribed, and although this involves a considerable amount of repetition, there is no doubt that the facts of the year are in this way presented in a very striking manner, and in one calculated to prove very useful to the local authorities who have primarily to do with the collection of these statistics. Some information is given regarding the assistance rendered by the vaccination staff in the examination of the primary registers, but details of the results would

be of interest, not only as regards the inspections made by them, but also as regards the inspections made by the Sanitary Commissioner himself, by his deputies, by the Civil Surgeons, and by all other officers on tour who have been called on to perform this duty.

2. *Births.*—The general birth-rate of the Bombay Presidency, deduced from the statistics of 1892, was 34·57 per 1,000, the highest of any province during the same year being 39 in the Hyderabad Assigned Districts. For the previous ten years the average annual ratio in Bombay was 35·16, the fluctuations in the yearly figures running between 38·97 and 29·86. The birth-rates of the later years have been above those of the earlier ones, which is a sign that there has been some—though not any great—improvement in the registration, for, even if taken by itself, without further evidence of inaccuracy, it is beyond question that the actual birth-rate must be considerably in excess of 34·57 per 1,000. Such further evidence of inaccuracy is supplied by the details regarding different districts and registering circles. As regards the proportion of male and female children born, the Sanitary Commissioner cites nine districts in which the percentage of males exceeded the general average to a marked extent, this percentage in one case, that of Thar and Parkar, amounting to 133. And if we examine the details for separate circles we find an even more remarkable excess of male births in some few of them, while in others, on the other hand, there is just as remarkable a deficiency. as for example in Belgaum town, where they equalled only 68 per cent. of the female births. Again, the district rates display extraordinary fluctuations—between only 16 in Thar and Parkar, where registration is still admitted to be most imperfect, and 46 in Nasik. Assuming that every rate not over 35 per 1,000 must be inaccurate, we find from the diagram of rural circles that only 123 of them fulfil this condition. In many of the districts the circles of rural registration nearly all come within the areas of default. After many years of registration this result is by no means satisfactory. In the 56 towns for which separate statistics are given, there seems to be no greater accuracy than in the rural circles. In them the birth-rate ranges between 16 and 53, and there are only 25, or less than one-half, where the rate exceeds 35, and which can therefore be regarded as possessing even the semblance of accuracy.

3. *Deaths.*—In examining the figures of death registration, it is not possible to speak with the same confidence as to the evidence they afford of careful or neglectful registration, because in India death-rates vary enormously from one year to another. All we can say is, that in many cases those recorded in this report for 1892 seem most improbable. Among rural circles they vary between 7 and 65 per 1,000. Among the towns the range is between 16 and 63. In looking at the details of Form II. attention is at once drawn to the very different death-rates recorded in adjacent places, but experience shows that this alone forms no ground for doubting the statistics, for there is nothing more noteworthy in the history of disease than its localization. The year was certainly most unhealthy and the total number of deaths recorded was nealy 100,000 in excess of the maximum of any of the previous ten years. In 1891, which heads the list for this period, the number was 513,132, but in 1892 it rose to 611,742. Influenza in Sind and Gujerat, cholera all over the Presidency, and fever in the autumn, more especially in Gujerat, were the chief diseases under which this great mortality was registered, and these again seem to have been at least in some measure due to great scarcity of food in parts of the south during the early months of the year and unusually heavy rain in September. Great as the mortality was as compared with other years, it is to be noted that it fell very far short of the results in the Punjab, where the death-rate equalled over 49 per 1,000, and the rate for fevers alone (34·83) was more than the death-rate due to all causes in Bombay (32·50). Here, notwithstanding the unusual loss of life, the births still exceeded the deaths by 2·07 per 1,000, whereas in the Punjab the deaths exceeded the births by 11·32.

4. *History of the Chief Diseases: Cholera.*—As already stated, a severe epidemic of cholera was one of the main causes of the great mortality of the year. The total deaths recorded under this head was 42,900, or 25,050 more than in the preceding year. The death-rate equalled 2·28 per 1,000 for the Presidency as a whole, but, as we shall see presently, the district rates of which this is formed varied greatly. The disease was present in one or other district during the entire year, but in the first three months it was almost entirely confined to Dharwar, where more than 3,000 fatal cases occurred during that period. After that the disease became more general. In July it was attacking every district except one. In that month it attained its maximum and then declined, but it had not disappeared from the province in December. The mortality this epidemic occasioned varied between 7·91 in Dharwar district and 0·08 in Ratnagiri. Form VI. shows that many of the towns suffered even more than Dharwar, the cholera mortality having been 11·69 in Hyderabad and 12·11 in Karachi. Of 285 circles of registration 237 returned deaths from cholera, but these were limited to 3,080 out of 25,206 villages. The map shows very clearly the relative intensity of the disease over different parts of the province, and full details are also given illustrating its incidence in the different circles. In some places the disease is attributed to importation, but as the evidence on this point is not recorded in full it is not possible to judge what value ought to be attached to it.

5. *Insanitary Conditions in connection with Cholera.*—This, however, is but of small moment, for even if the epidemic were proved beyond all doubt to be due to importation, no means could possibly be devised to prevent it. Much more important is it to examine the sanitary condition of places which suffered. The Sanitary Commissioner, for example, mentions 11 towns in which the death-rate from cholera exceeded 5 per 1,000, commencing with Hyderabad, already referred to, with its ratio of 11·69, but no description is given of their state in respect of drainage, water supply, and conservancy. We turn to the sanitary estimate of towns and villages which forms Appendix III. for information on these points, but have been unable to find it. Some of the places seem not

to be entered at all, and in regard to others the data are scant. It would seem that this sanitary survey includes only those places inspected by the Deputy Sanitary Commissioners during the year. The death-rate of each place moreover is wanting. We observe that it is given in Appendix VI. in connection with civil sanitary works, but it would find a much more appropriate place in conjunction with a description of the sanitary defects. A more complete form of return, such as we have previously recommended, and which would avoid needless repetition, is obviously much wanted, and we trust that it may be supplied in future years, care being taken to give full information under every heading it contains. From a practical point of view, it should be borne in mind that this comparison of death-rates and local insanitary conditions is really the most important part of the whole Sanitary Report. Appended to the Sanitary Survey Statement are some extracts from reports by Civil Surgeons. As bearing on cholera prevalence, we may remark on the "pits in which night soil is deposited" at Satara, and also the "proper cesspools" referred to at Shikarpur and Upper Sind frontier. Both pits and cesspools of all kinds are most objectionable methods of disposing of night soil, and should not be mentioned except to point out the dangers to which they both give rise.

4. *Small-pox and Vaccination.*—Although small-pox added only ·15 per 1,000 to the total mortality of the year, it caused very nearly double the number of deaths it did in 1891. The highest ratio in any one district was ·67. The towns also show generally low rates, anything above ·20 per 1,000 being rare, and the maximum only 3·09. In paragraph 85 a statement is given showing for each district the number of deaths registered as due to small-pox during each year from 1881 to 1891, and the ratio of successful vaccinations per 1,000 of population. No comments have been made upon it, and yet, as concerns the efficiency of the Vaccination Department, the influence of vaccination on small-pox is the one point that demands the closest attention. All else concerning vaccination, the number of operations performed, the degree of success claimed, and all other particulars are of no importance whatever compared with the influence of vaccination in diminishing small-pox. This is the one and only true test to which the work of the Department must come. It is, therefore, of great moment that the figures for a series of years of both vaccination and small-pox should be examined side by side, and that the conclusions which these figures warrant should be carefully weighed. In its present shape, however, the statement cannot be made much use of. Instead of the annual number of deaths the death-rate in each district should be shown, and then the results arrived at over a series of years compared. It is not understood why the year 1892 is omitted from this statement. As a whole, the evidence in favour of the excellent work done by the Vaccination Department of the Bombay Presidency over a series of years is strong, but the more strikingly it can be exhibited the better, for there could be no more effective means of overcoming prejudices and demonstrating the real protection from small-pox which successful vaccination offers. Although the work of 1892–93, as shown in the separate report on vaccination, was somewhat less than that of the previous year as respects both primary cases and re-vaccination, it compares favourably with that of other years.

7. *Fevers.*—The deaths from this cause numbered 438,038, being 69,125 in excess of the total of 1891, which, in its turn, had shown the heaviest mortality under this head of all the years of which the figures are compared. It is worthy of notice also that the marked increase of 1892 was very widely diffused, every one of the 24 districts, except two, returning a higher ratio than it did in the previous year. It was, however, in Gujerat and Sind that the fever epidemic was most severe, the highest ratio of deaths being in the district of Ahmedabad, where it attained to no less than 41·41 per 1,000. The fact that the maximum monthly mortality from fevers took place in January seems to point unmistakeably to other causes having been at work in addition to those which are classed under the general head of malaria, but beyond the incidental mention of the fact that influenza was prevalent in several parts of the Presidency, and that the epidemic of this disease, which commenced in the end of 1891 in Gujerat and Sind, continued in 1892, there is no information regarding this important event in the sanitary history of the year. No great light could be expected to be thrown upon it by the mortuary statistics, in which influenza would, in all probability, nearly always be classed as fever, but a more detailed examination of the monthly returns, taking in particular those districts which suffered most in 1892, would have afforded interesting data such as might have been employed for estimating the loss of life that ought to be apportioned to influenza. Comparing the results recorded in this report with those recorded in the Punjab report for the same year, there is a similarity in the matter of fever between the experience of Sind and Gujerat and that of many districts of the Northern Punjab which is very striking, and which compels the conclusion that some great and widely acting cause must have been at work in both about the same time. In both there was excessive rainfall and food also was dear. The influence of these factors on the mortality from fevers and other causes in the Bombay Presidency during 1892 is so far illustrated in statements in which the mortuary statistics are compared with the meteorological conditions and the prices of food over a series of years. These figures are given without remark, but it is very desirable that they should be carefully analysed and that it should be stated whether they afford grounds for any definite conclusions. This can be properly done only by the Sanitary Commissioner, who is acquainted with the geographical, geological, and other local conditions, which ought all to be taken into account.

8. *Sanitary Works.*—Information regarding sanitary progress made during the year and the action taken to assist it is contained in remarks of nine municipal towns which the Sanitary Commissioner visited, in the Annual Report of the Sanitary Board which forms Appendix II., and in the last column of the Sanitary Estimate of Towns and Villages, which is headed "Measures adopted." This last, we regret to see, is to a large extent blank. The Sanitary Board had many important matters under their consideration during the year—projects for water-supply and drainage plans, estimates, &c.—and it may therefore be anticipated that the next annual Report will chronicle much valuable

work done as the result of these preliminary operations. At Ahmedabad we observe that sewers have been laid in one section of the town, and that the liquid is pumped up to a sewage farm which had been recently started.

6. *Sanitary Board.*—The annual report of this Board has been already referred to. No change has been made in the constitution of the Board, which consists of two officers, the Sanitary Commissioner, and the Sanitary Engineer, who was added in January 1892.

10. *The Pilgrim Traffic to Mecca.*—The report of the health officer of the port of Bombay is an interesting record. We shall refer only to that portion of it which deals with the Mecca pilgrims, because we would suggest that more details on this important question might be given every year with advantage. The experience of the recent International Sanitary Conference at Paris has shown how important it is in the interests of India that all the facts on this subject should be accessible. We believe that they do not by any means bear out the accusation that cholera outbreaks at the holy places have been caused in any case by vessels transporting Indian pilgrims to the Red Sea. We believe, on the contrary, that when cholera does attack these places it has advanced along the land route through Arabia, but as this is a disputed point nothing but carefully collected evidence can settle it. On this account means, we suggest, should be taken to collect the facts concerning the pilgrims leaving all Indian ports every year, so that they may be collated in the Annual Report of the Sanitary Commissioner with the Government of India, or, if the alternative be considered preferable, they might be collated by the Port Health Officer of Bombay who already has to deal with the great bulk of them, and has given much valuable information concerning those who embarked from Bombay. We shall merely indicate generally the various points in regard to which data should be collected every year. They are as follows:—

(*a.*) The exact manner in which the medical inspection of the pilgrims is conducted before they leave Bombay.
(*b.*) The number rejected, and causes of rejection.
(*c.*) The number of paupers.
(*d.*) Name and tonnage of each pilgrim vessel, with date of departure and number of pilgrims on board.
(*e.*) The number and causes of deaths after departure, with exact dates, especially regarding any cases that appear to have been of a cholera nature.
(*f.*) The experience of the pilgrims at Camaran.
(*g.*) Number and causes of deaths on the return voyage.
(*h.*) Number of pilgrims of the year who returned, indicating the proportion missing.

Many of these details are already clearly given by Surgeon-Captain Crimmin, but it is desirable that the statements employed for the purpose should be on one uniform plan, and that they should be procured from all Indian ports whence pilgrims to Mecca embark.

8th June 1894.

No. 12.

Memorandum by the Army Sanitary Commission on the Report of the Sanitary Commissioner of the Hyderabad Assigned Districts for 1892.

1. *General Character of the Year.*—The year 1892 in this part of India presented a marked contrast to its predecessor. The one was healthy, and the other unhealthy. This fact is brought out prominently in the general death-rate which fell from 40·6 in 1891 to 28·8 per 1,000 in 1892, and it is worthy of notice that this great difference was not due to the special absence of sickness during 1892 in one or more places where it had been prevalent during the previous year. In every district there was a more or less marked diminution in the death-rate, and, therefore, one may safely conclude that there was an equally decided reduction in the amount of sickness among the people. The same contrast is observable if we follow out the comparison in greater detail, for of the 33 towns for which separate statistics are given, all but one yield a lower death-rate and, in most cases, a much lower death-rate, than they did in 1891. In the one exception the difference is trifling. That some great general causes were at work throughout Berar which rendered the population more subject to sickness and death during 1892 than they were during the following year is self-evident, and experience in India has shown that similar contrasts are to be found not only over a single province but over much larger areas. Still the fact, self-evident as it is, is often overlooked, and epidemics are attributed to local and accidental causes which are totally inadequate to account for them. In accordance with a suggestion which we made some time ago, more detailed information is now given regarding the meteorology of the year and the current prices of food—two important factors which, doubtless, have much to do with the health of the people; but the data in the report do not warrant any decided conclusion being drawn except that, as a rule, though not an invariable one, increased rainfall was attended with increased sickness. At the same time it must be borne in mind that in a matter of this kind the comparison of only two years is insufficient, and that sound conclusions cannot be drawn until the data have been collected and compared over a considerable period.

2. *Continued attention to Registration.*—Continued effort has been made to render the record of births and deaths more accurate. Much progress, as we have had occasion to remark in noting on the reports of former years, had already been made in Berar towards this most important object, and the further information now furnished shows that more has been done in the same direction. In many of the districts inspection of the registers to a large extent has been carried out in the course of their tours by district officers, police officers, the vaccinators, and also by the Sanitary Commissioner himself, and although the results noted are very various and, in some instances, especially in one or two of the larger towns, indicative of much neglect, they show on the whole that a great work is being successfully carried on under no small difficulties. There is, moreover, reason to believe that now the inspections have been more fully established, the expectation of a visit from an inspecting officer will tend to the registers being more accurately kept. The Commissioner, we are glad to observe, has issued instructions "which must have the effect of inducing revenue and police officers to inspect "the registers of births and deaths more systematically and frequently than hitherto, and of securing "further improvement in registration generally." It would add much to the usefulness of all such orders, by keeping them prominently and permanently before those concerned, if a copy of them were appended to the Annual Sanitary Report, which would thus become, as it ought to be, the recognised repository of all information and orders regarding the special subjects with which it has to do.

3. *Registration of Births and Deaths in relation to the Census.*—In annotating on the Berar Sanitary Report for 1891, we looked forward to having in this Report for 1892 a full discussion of the ten years' birth and death figures in conjunction with the results of the Census of 1891. Delay in the issue of the Census Report has no doubt interfered with this being done, but we trust that it may not be lost sight of, and that, though late, full advantage may be taken of the opportunity of applying such a valuable check on the figures. In some of the other provinces, the main data necessary for such a comparison were obtained in advance of the full data to be supplied by the Census Report, and no doubt it is of great advantage to discuss these matters while the interest in them is still fresh and the facts may be more easily used for practical purposes, such as pointing out discrepancies and otherwise, leading the way to more accurate registration.

4. *Births.*—There was a diminution in the birth-rate, which fell from 42·8 in 1891 to 39·9 per 1,000 in 1892. It is worthy of notice that reduction occurred not only over the province as a whole, but in every district taken separately. From this remark the Sanitary Commissioner excepts Akola. He says, "there is a decrease of births in all the districts except Akola," and the same is noted in both the Commissioner's and Resident's observations on the report; but this statement is not borne out by the figures given in Table I., paragraph 7, where the birth-rate for 1891 in the Akola district is entered as 47·6 for 1891 and 43·7 for 1892, or a reduction of 3·9 per 1,000, and on reference to the report for 1891 and to the Statistical Tables for 1892, these figures seem to be correct. In almost every town also out of the 33 towns for which the figures of the two years are compared, there is more or less reduction. Only seven show an increase. In all the others the birth-rate fell, and in several the fall is very marked, as in Balapur from 48 in 1891 to 36 in 1892, and in Jamod from 61 to 42. No explanation is given of the reduced birth-rate, and the subject might have been more fully discussed with advantage. The result is the more remarkable because the year 1892, as already shown, was decidedly more healthy than 1891, but much of the diminished birth-rate of 1892 may have really been due to the unhealthiness of 1891. Without a record of the births by months and a comparison of the monthly figures with those of other years, it is not possible to form any conclusion on the point, but it is one which is of interest and might receive attention in future reports. Form No. I. in the Appendix, the only one which deals with births, has now been expanded so as to show each registering circle separately. This can easily be done in a small province like Berar, but in the larger provinces it would involve the expenditure of many pages. In Berar there are only 100 circles of which 33 are towns and the others rural. There is, however, a discrepancy in the matter which needs explanation, for whereas the number of registration circles in Forms I. and II. appears as 100, the number in Forms Nos. VII., VIII., IX., and X. appears as 121. In the North-West Provinces and Oudh the circles number more than 1,100. The results in Berar generally for 1892 are indicative of careful registration. There are still a few taluks, as brought out by the summary given in paragraph 8 (Table No. 3), which need looking after, such as Kelapur in Wun and Mekhar in Buldana, where the range between the minimum and maximum is high; but as the population of each is not given, it is not possible to say how far the result may be due to the fluctuations which are inseparable from dealing with small numbers. In any comparisons of this kind that are made it would be more convenient if the registering circles were regarded as the unit, and reference made only to them. In the Amraoti district, for example, from Table 3 there appears to be 4 taluks and 15 rural registering circles; but how these registering circles are ranged in the taluks is not clear, either from Table 3 or from annual Form No. I.; whereas if the registering circles alone are dealt with, full particulars regarding them are given in the No. I. Form, and comparison is simple. In 1891, owing to the unhealthiness of the year and the consequent high death-rate, the births exceeded the deaths by only 2·2 per 1,000 of population; whereas in 1892, even with a diminished birth-rate, the excess of births was 11·1 per 1,000. In only 9 of the 100 registering circles during 1892 did the deaths exceed the births. Form No. I. has been further improved by including a separation of the population according to sex, an item of information which was formerly wanting, but is of great importance in considering birth-rates. Some few of the ratios recorded in 1892 are so high as to suggest the advisability of careful local inquiry concerning them. On the other hand, there seems to be uniform testimony on the part of all the inspecting officers to the effect that when errors have been discovered in the registers they have been in the way of omissions,

and that in many places the birth-rates were really higher than those which have been recorded in the statistical tables.

5. *Deaths.*—We have already noted the great reduction in the mortality for 1892 as compared with the year previous. The total number of deaths in the province fell from 115,558 to 82,124. There was reduced mortality not only in the province as a whole but in every district of which it is composed. We have already remarked on the widespread character of the general influences which affect the health of the people, and the truth of this is well illustrated in the history of Berar. The following are the district death-rates of the province, during each of the last five years:—

Per 1,000 of Population.

——	Amroati.	Ellichpur.	Wun.	Bassim.	Akola.	Buldana.	Provincial Total.
1888	25	26	19	21	25	29	24
1889	44	40	37	49	39	44	42
1890	37	35	29	30	36	40	35
1891	42	45	30	35	47	41	40
1892	28	33	24	26	31	30	28

It will be seen that although the ratios of increase and decrease varied greatly, they affected the whole province. In 1889 there was a rise in the death-rate of every district. In 1890 there was a fall in the death-rate of every district. In 1891 again there was a rise all round, and then again a general decline in 1892, manifested not only in all the districts taken one by one, but also, as already mentioned, in all the 33 towns with one solitary exception. There is thus ample evidence of great general influences having been at work, but it is with the local influences that the Sanitary Department has mainly to do, and the account which is given of them is very unsatisfactory. In six of the towns which are specially named by the Sanitary Commissioner, the mortality varied between 39 and 56, and regarding them he says, "they are all in a most insanitary condition with an impure water-supply." The chief cause of death in them have been fevers and bowel complaints, and no improvement can be expected in these results so long as existing evils are allowed to continue. Form No. II., which deals with the general distribution of the deaths, has now been expanded in a similar way to that adopted with No. I., so that the results in each registering circle can be considered separately, and in this way attention is at once drawn to those places which have suffered most, and which therefore most urgently require to be taken in hand.

6. *History of the Chief Diseases. Cholera.*—The reduced mortality of 1892 was manifested under every heading except small-pox and injuries, under both of which there was a slight increase. The figures for the two years stand thus and the contrast between them is very marked:—

——	Number of Deaths.		Death rates.	
	1891.	1892.	1891.	1892.
Cholera	7,958	2,030	2·8	·7
Smallpox	34	68	·01	·02
Fevers	49,850	41,661	17·5	14·6
Dysentery and diarrhœa	22,007	11,200	7·7	3·9
Injuries	1,090	1,140	·4	·4
Other causes	34,619	26,025	12·2	9·1
Total	115,558	82,124	40·6	28·8

The deaths from cholera it will be seen fell from 7,958 to 2,030. The disease, although so much reduced, was not confined within a more limited area than it had been in the year previous. It was present in every district for at least three months out of the 12, and for nine of these it did not leave the province, but the diminished intensity of the producing cause is indicated not only by the smaller number of deaths but also by the much smaller number of villages attacked. The figures given in the two reports stand thus:—

District.	Number of Villages from which Cholera Deaths were reported.	
	1891.	1892.
Amraoti	100	22
Ellichpur	57	15
Wun	48	16
Bassim	61	11
Akola	117	28
Buldana	149	53
Total	532	145

The total number of villages in Berar is returned as 5,718. These figures are very striking, and have a direct bearing on the causation and, what is still more important, the prevention of cholera. At six places where outbreaks occurred the disease was reported to have been due to importation. But even if this had been proved beyond all manner of doubt it would afford but little or no practical help in dealing with the question. It is simply impossible to devise measures which could prevent such importation, but, happily, the general history of the disease, as indicated in the figures above cited, shows very clearly that far too great stress has been laid on this supposed cause of cholera epidemics, and that other causes have to be taken into account which fortunately can be dealt with much more easily and effectively than attempts at controlling the free and unrestricted movements of the people. These causes are the local insanitary conditions which so frequently prevail in Indian towns and villages, and of which examples are not wanting in this report. Balapur in the Akola district, which suffered more than any other place in Berar, is described as "one of the filthiest towns of the province." The town of Hiwarkhed, which stands next in order of cholera mortality, is spoken of in the sanitary estimate as a place where the surroundings are "very filthy. People defæcate "anywhere and everywhere, and the fœtid odour pervades the approaches to the place. Cesspools "and accumulations of refuse in house enclosures." With such a state of things it is easy to understand the prevalence of disease and at the same time to devise the measures of improvement which it is so very desirable should be carried out.

7. *Small-pox and Vaccination.*—As already mentioned there was an increase of small-pox. As a matter of fact, the deaths under this head in 1892 were just double what they had been in 1891—68 in one year compared with 34 in the other, but even the higher figure is so small that the disease was still very slight. Five of the six districts furnished deaths, and they were distributed over 23 villages and one town—the town of Amraoti where a solitary fatal case occurred. The statistics of small-pox in Berar generally bear testimony to the excellent work done by the vaccination branch of the Sanitary Department. Small-pox, like other diseases, has its periods of abeyance and of epidemic prevalence, but the records show that during the last 12 years the results have been much more favourable than during the 12 years before that. During the first 12 years, 1869 to 1880, the total number of deaths from small-pox was 38,840, whereas during the second 12, or from 1881 to 1892, the number was only 8,828. In the separate report on vaccination for 1892–93, the evidence in favour of the protection afforded by vaccination is given in an interesting table, in which the extent of vaccination and the mortality from small-pox are compared for each year, commencing with 1868. Taken in averages of five-year periods the results stand thus:—

	Successful vaccination per 1,000.	Mortality from Small-pox per 1000.
1st period, 1868–72	8·92	2·02
2nd „ 1873–77	25·72	1·56
3rd „ 1878–82	31·2	·58
4th „ 1883–87	34·68	·38
5th „ 1888–92	35·8	·2

This is very satisfactory and especially the work done in 1892–93, whether measured by its extent or the percentage of success or the proportion of the children born during the year who have been protected. It is gratifying to find that the people are beginning to realise more fully the benefits of vaccination.

8. *Fever and Other Causes of Death.*—It is doubtless quite true, as the Sanitary Commissioner remarks, that the great heading of Fevers, under which the largest share of the mortality in every province is invariably recorded, includes many disorders of which fever is a mere symptom; but there is every reason to believe that the great mass of such cases, and also we may add of those recorded under the head of dysentery and diarrhœa, are due to that general cause, which, for want of a more definite name, is called malaria. How potent and widespread is the influence which this exerts is to be seen both by the large number of deaths these two heads contribute, and also by the general character of the fluctuations in this number which are manifested year by year. In 1892 41,661 persons died from fevers, and 11,200 from dysentery and diarrhœa. The two great heads together account for 18·5 per 1,000, or nearly two-thirds of the total mortality of the province, which amounted to 28·8. And if we look at the statistics of the 25 years which are tabulated at pages 23 and 24 it is surprising how the general character of the year is impressed more or less on every district. In 1892, for example, the deaths from fevers fell to 41,661 from 49,850 in 1891, and this fall was participated in by every district except Bassim, in which the figures for the two years were nearly the same. Under dysentery and diarrhœa a similar result is to be seen, but in a much more decided degree. In 1892 the deaths recorded under this head were little over one-half of the total of the year previous, and in every district taken separately there is a reduction in much the same proportion. Like results will be found if the statistics of other years are examined. The great lesson to be learned from these and other like facts, which might be multiplied almost indefinitely, is that the general experience of a people as regards health or disease in any year is not a matter dependent on accident, that it is governed by general laws, the nature of which we still know little of, and that the greatest aids to health and the most powerful protectives against disease are to be found in measures of local sanitary improvement.

9. *Distribution of Mortality in relation to Local Defects.*—To discover defects in the sanitary condition of towns and villages, and to have them removed or remedied because they are, or at any time may become, causes of sickness and death, is the great work to be accomplished by the Health Department in every province, and annual reports are valuable mainly in the proportion in which they show that this is being done. In this report for Berar the defects are dealt with in the sanitary estimate which covers pages 27 to 39, and again, on page 42, there is some repetition of the same, with a few data added regarding six municipalities. It would be more convenient if the whole information were given in the one form of "Sanitary Estimate," which should be amplified in some such way as that suggested in paragraph 21 of our memorandum on the Report of the Sanitary Commissioner with the Government of India for 1890 (recommendation 3). The form now used gives the death-rate under certain headings, but the total death-rate for each place is not entered except for municipalities; this is indispensable in every case in order that local conditions and the state of the public health may be examined side by side. The state of the drainage, the water-supply, and the conservancy in the towns and villages, is by no means satisfactory. Of this the local authorities are well aware, and they are evidently striving with the small means at their disposal to effect improvements which want of funds and the apathy of the people render very difficult of accomplishment.

10. *Sanitary Improvements.*—In the municipalities much attention was paid to conservancy and 61·1 per cent. of their income was spent on sanitary work. The only large operation on which funds were expended during the year appears to have been the improvement of the water-supply of Akola. It would seem that part of this expenditure was provided by the municipality and part by the Public Works Department, from which last also considerable sums were spent on water supply at Buldana and other improvements elsewhere. The amount of progress made would be more clear if the work done in each place were shown locally and not according to the source from which the funds are obtained. The most important point to know is—what has been done in each municipality or other locality. It would be simple to show this, and in the same form to indicate the department by which the work was done. In the districts, during 1892, Rs. 1,48,571 were spent on "village conservancy, construction and repairs of wells, up-keep of roads, side gutters, watering and planting trees, removal of rank vegetation, &c."

11. *Sanitary Boards.*—This Report and the Commissioner's remarks upon it show that though progress is necessarily slow the work is being taken up in a systematic and practical manner. The survey of towns and villages has been continued. The Sanitary Commissioner held meetings with the District Sanitary Boards, and his recommendations for improvements were recorded. Reports are submitted to show how far, and at what cost these have been acted on, and what part of them still remains to be done. It would seem that the meetings of these Boards take place only once a year. The summary of their proceedings during 1892 shows that the sanitation and water-supply of 140 villages throughout Berar was discussed. In 41 villages improvement in these important matters had been completed, and in the remainder such improvements had not been completed for want of funds or other causes.

12. *Regulation of Fairs*—In the concluding chapter interesting information is given regarding fairs. It appears that every year 42 fairs are held in the different districts of Berar, and that the approximate number of people attending them is from a few thousand at some to as many as 50,000 at others. It is satisfactory to learn that there has been a general improvement in the management of these fairs as regards conservancy, water-supply, and other sanitary requisites, and that it is part of the recognised duty of Civil Surgeons to see that these important matters are well attended to. In these reforms is the best safe-guard against those epidemic outbreaks of disease, to which those attending fairs in India are so prone.

8th June 1894.

No. 13.

Memorandum by the Army Sanitary Commission on the Administration Report of the Commissioners of the Town of Calcutta for 1892–93.

1. *Progress in Sanitation during the last 35 Years.*—This Report has reached us much later than usual, several months indeed after all the other Indian Reports of the year had come to hand, and we have not yet seen the orders of the Bengal Government upon it. Many of the important questions with which it deals have been discussed in previous memoranda, and we propose now to confine our remarks, in the main, to one or two of the most noteworthy points suggested by the history of the year. Before entering on these, however, we may refer to the opening chapter of the report in which a summary is given of the progress sanitation has made in Calcutta during the last 33 to 35 years. For the most part this summary is a reproduction of the principal figures contained in a very interesting paper which was read before the International Congress of Hygiene and Demography, held in London in 1891, by the Honourable Mr. Cotton, who has had many years experience of Calcutta, and, having been for some time himself Chairman of the Municipality, is well acquainted with the subject in all its bearings. It will not be out of place to repeat a few of the main facts here, because Mr. Cotton's original paper and the Calcutta Municipal Report, although both widely circulated, do not fall into the hands of many who see the Annual Sanitary volume issued from the

India Office, and it is very desirable that everyone, and more especially foreigners, who write at times as if little or no progress in sanitation had been made in India during all the years of British occupation, should realise how much has been done in Calcutta, and how much more is being attempted under very difficult circumstances. As far as possible, the figures have been brought up to 1st April 1893, the day to which the present Report extends. During these 35 years there have been expended,—

	Rs.
On drainage - - - - -	1,11,27,700
On water-supply - - - -	1,63,00,000
On Bustee Improvement - - - -	8,68,961

For this sum have been constructed 43 miles of main or brick sewers and 144 miles of pipes sewers. The number of premises connected with the sewers is 27,560. On 1st April 1893, the daily supply of water averaged 30·84 gallons of filtered and 9·47 gallons of unfiltered water per head of population. The quantity is thus ample and the quality is excellent. In addition to these great works of drainage and water-supply and improvement of the bustees, the amount of refuse removed from the town has quadrupled what it was in earlier years; 277 filthy tanks have been filled up; 88 bathing platforms have been constructed for the use of the poorer inhabitants, and six public squares have been laid out to the great advantage of the localities concerned.

2. *Benefits derived from these Improvements.*—It is during the last 14 years that the chief progress has been made, and the statistics of these years, divided into quadrennial periods, show that there has been a marked reduction in the mortality. In the town proper, notwithstanding the progressive increase of population during the first of them, the deaths numbered 62,226, whereas in the second they were only 49,863, and in the third only 38,089*. The vital statistics of Calcutta are always open to exception, because the conditions are so peculiar. There is a constant change in the population, a continual influx of people seeking work, and a frequent return of others to the country especially among those who have fallen sick. It is more than probable that with the increased facilities for travelling which have been afforded of late years such movements of population have increased, and on this account the statistics of different periods may be vitiated to a certain extent as an index of relative mortality. But although this may be true of the deaths generally, the objection has little force when applied to cholera deaths, for the attack of this disease is so sudden and its progress either to death or recovery as a rule so rapid, that removal can have but a very trifling influence on the record. It is therefore gratifying to find that the reduction in the cholera deaths has been just as marked as the reduction in the general mortality, though the fluctuations in the intensity of the disease from one year to another are as distinct as they ever were.

3. *Rise in Value of Town Property consequent on Improvement in Health.*—Another very interesting and important result of the greater healthiness of Calcutta, which has been brought about by the improvements, is that the value of town property has enormously increased. It is estimated that the value of land in the town "has more than doubled since 1878, and that the increased value "to the owners is about nine crores of rupees." One practical effect of this remarkable rise ought certainly to be to advance the progress of sanitation in India in a very decided degree. The natives are fully alive to the advantages of health, though not always convinced that it will be obtained by the measures recommended by the sanitary authorities; but when they find that health not only is improved by such measures, but that their property is also rendered much more valuable, they will have a new and powerful motive for supporting the cause of reform. But in order to attain this much desired result, time and patience are essential on the part of the authorities. The evils which have grown up under centuries of neglect cannot be swept away even in a decade. It is essential that we should carry the people with us, they must be educated gradually to understand the value of the changes proposed, and for this purpose they could have no better object lesson than the experience of Calcutta during the last 35 years. We are led to make these remarks by the discussion which has taken place in this and other Municipal Reports on the subject of the building regulations in native towns and cities. We entirely agree with the Health Officer of Calcutta as to the importance of open spaces and other means for ensuring proper ventilation in houses, but under all the circumstances we recognise the wisdom of the course pursued by the Commissioners and approved of by the Government. As Sir Ashley Eden remarked in his orders on the Calcutta Report for 1876, "One case in which native society is induced by conviction to adopt a sanitary theory is worth "hundreds of cases in which they are pressed into submitting to reforms of the benefits of which "they are not satisfied."

4. *Continuance of Sanitary Improvements.*—The municipality of Calcutta may well be proud of all it has achieved in the face of very great difficulties of all kinds. At the same time it is essential to realize the urgent need for continuing the great improvements which have been effected, and to this the Commissioners, as shown in this report, are fully alive. Among the works which had either been completed, or were in progress during 1892–93, may be mentioned the opening of the Harrison Road, the partial completion of the Lansdowne Road, and of the Puddopooker Tank Square, new settling tanks at Pulta, a flushing reservoir for the Circular Road sewer to hold 300,000 gallons, and a number of other works of more or less magnitude which are fully described in the Report. In the

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* This is the statement given in the Calcutta Municipal Report, but it would seem to be to some extent incorrect, and ought properly to stand thus:—

1st period	(4 years)	- - -	52,226 deaths
2nd "	"	- - -	49,863 "
3rd "	"	- - -	45,793 "
4th "	(3 years)	- - -	38,089 "

future three lakhs will be set aside every year for expenditure on the improvement of the suburban area which was incorporated with the town proper a few years ago, and in which much necessarily remains to be done. In all the accounts that are given of work actually completed or in progress little mention is made of the sanitary defects which still exist, and of the measures which are in contemplation for dealing with them. The current work, no doubt, is sufficient to engage the attention of the authorities, but a clear sanitary programme has great advantages, especially if it be drawn up by localities, and contrasted in its progress year by year with the statistics of births and deaths.

5. *Statistics of* 1892. *Births.*—The vital statistics in this report refer, as usual, to the calendar year, and, in common with many other interesting matters, are discussed fully by the Health Officer. The general birth-rate for the whole town equalled 18·6 per 1,000, which is the highest rate since the town and suburbs were amalgamated. Taken separately, the rate for the town proper was 17·4, which was much the same as usual, and that for the suburbs 21·2, which is the highest recorded. If we turn to Table No. 5 of the Appendices, one of the two tables facing page 148 of Part II. of the report, we find some further details regarding both births and deaths which are worth attention. This table is devised on the model we suggested some years ago, and supplies much interesting and valuable information as to the incidence of both births and deaths according to wards. The general disproportion between males and females in the population, which has been so often referred to, gives a complete explanation of the low birth-rate. Taking the whole area, the males equalled 190 to every 100 females. In the town proper the figure for males was 211, and in the suburbs it was 153. Under these circumstances a greater difference should have existed between the town and suburban birth-rates than that deduced from the records. There are also other unexpected results in the returns from individual wards, though generally the birth-rate increases according as the number of the sexes approximates, and decrease as it diverges.

6. *Deaths.*—The general death-rate was 2 per 1,000 less than in 1891 and almost exactly the same as it had been in 1890, but if the town proper and the suburbs be taken separately we find that in the town proper the mortality in 1892 differed little from that of 1891 (27·1 compared with 27·9), whereas in the suburbs there was a marked reduction from 39·4 in 1891 to 34·8 in 1892. As regards both births and deaths there was thus evidence of improvement, the births were more numerous and the deaths were fewer. If we turn again to Table No. 5, already referred to, we find that in both town and suburbs there are marked variations in the individual wards. In the town itself the mortality ranges between 13·3 and 33·2. In the suburbs the range is between 20·9 and 44·1 In Table 6 the deaths both in town and suburbs separately and in both combined during 1892 are compared with the figures of the previous 10 years and with the annual mean of these figures as recorded under the five principal heads—Cholera, Dysentery and Diarrhœa, Fevers, Small-pox, and Other Causes.

7. *Cholera and Water-supply.*—Of these diseases the only one which calls for special remark is cholera. The year 1892 was one of great cholera prevalence over great parts of India, and Bengal suffered from it to a large extent in common with many of the other Provinces. As a whole, the town of Calcutta recorded 2,019 deaths from this cause. In both city and suburbs there was a diminution compared with the year previous, but this diminution was chiefly in the suburbs, where the deaths were little more than half what they had been in 1891. This result is all the more remarkable because in Howrah, which is the other large suburb of Calcutta, and which has generally suffered less from cholera than this suburban area now incorporated with the town, the deaths from cholera instead of being fewer were much more numerous than they had been in 1891. The figures for the two years stand thus :—

	1891.	1892.
Suburban area - - - - - -	1,500*	762
Howrah - - - - -	490	771

The marked diminution in the suburban area, especially when compared with the very different experience of Howrah, is attributed to the new water-supply which was introduced into the suburbs in 1890, and there seems every reason for believing that this conclusion is correct, and that as the supply becomes more widely distributed, and other sources from which the people draw impure water are shut up, the results may be even more gratifying, and there may be a marked reduction not only in cholera but in all other diseases. We have always insisted on the vast importance to the public health of good and abundant water, and should have been greatly disappointed if the suburbs had not benefited in a marked degree from the great sanitary improvement embodied in the extension to them of the Calcutta water. There is fortunately no difference of opinion among sanitary authorities as to the action that should be taken in this matter of water-supply, but there is a difference in the mode of interpreting the facts. The Health Officer of Calcutta, in common with many other high authorities, believes that a good water-supply is the one great preservative against cholera, because it is through the water that the cholera germ enters the body, and that without the entrance of this germ no one will suffer from the disease. Other impurities are of little or no consequence, except as an index of the danger of cholera germs also being present. Climatic influences and other general causes he regards as matters of comparatively no importance, and that therefore they may be eliminated from

* This is the number given in the comparative table at page 127, but on page 126 and also in Table 6 of the Appendix it is entered as 1,402.

the problem. The one thing to be done is to keep the cholera germ out of the water, and having done that, the community is safe. We are and always have been fully persuaded of the vast importance of a good water-supply as one of the first requisites of health, but we regard it as only one of them, and we are convinced that a good water to be worthy of the name must be free not only from one special element of danger but also from all impurities, every one of which is more or less a source of danger, and having provided such a pure water and every other sanitary improvement that can be obtained we still believe that there are general causes at work with which we are still most imperfectly acquainted, which have a decided influence on the public health, which go a long way towards determining the seasonal prevalence of different diseases, and also towards determining whether the year shall be healthy or unhealthy. Whether these general causes be regarded as climatic or designated by any other name is a matter of little importance, but their existence is self-evident, for it is asserted year after year in the history of epidemic disease, and in none of these histories is it more plainly written than in the history of cholera in and around the town of Calcutta, where the seasonal rise and fall of the disease recur with such remarkable regularity, but varying as regards intensity in one year as distinguished from another, and happily tempered to a large extent in more recent times by the sanitary improvements which have been effected. The Health Officer speaks of the cholera germ as if the existence of such an entity had been demonstrated beyond all manner of doubt. We offer no opinion on this much disputed question, but we recall the fact that only a few weeks ago we were engaged in discussing a special report on this very question by Surgeon Lieutenant-Colonel D. D. Cunningham, who for the last five-and-twenty years has been endeavouring to discover a cholera germ, and as the result of all his painstaking and labourious researches, nearly all of which it is to be observed have been conducted in this town of Calcutta, has come to the conclusion that so far as we yet know there is no germ peculiar to cholera, that certain bacilli, including the one described by Koch are its frequent accompaniments, but that none of these are invariably present, that not one of them is distinctive of cholera, and still less can any one of them be said, with any show of reason, to be the cause of cholera. We have, however, only to do with practical work, and in so far as the water theory of cholera, as it is termed, will aid in urging on the improvement of the water-supply in all towns and villages, we have no fault to find with it, it being understood that this supply is to be guarded against all impurities, and that other sanitary matters, such as drainage, conservancy, and many others that might be mentioned, are also to receive due attention. We have opposed germ theories of cholera when they have been made the ground for recommending quarantine and compulsory isolation of the sick, and other measures of like kind, because we are persuaded that endeavours to carry out such measures must not only end in failure, but also cause much more mischief than they were designed to prevent; but good water is a blessing, regarding which there cannot be two opinions. We have every reason to believe that the improvement in the public health so well begun in the suburban area may become more and more decided, and that Howrah and many other places profiting by so good an example may very soon be induced to provide an equally good water-supply for themselves.

24th October 1894.

No. 14.

MEMORANDUM by the ARMY SANITARY COMMISSION on the ADMINISTRATION REPORT of the MADRAS MUNICIPALITY for 1892–93.

1. *Unfavourable Sanitary History of the Year.*—Although this report is as usual for the official year 1892–93, it deals with the statistics and other sanitary matters generally for the calendar year 1892. It may be said at the outset that, though the history of this year is not so unfavourable as that of the year previous in respect of the public health, it is still very unsatisfactory as compared with the ordinary experience of Madras. In submitting the report to the Government, the Acting President of the Municipality, Rai Bahadur P. Ramaswami Chettiyar, forwards a resolution by the Commissioners in which they record their opinion that "the Report is defective in that it gives no reason "for the steadily increasing spread of diseases in the city except fevers, and that the causes assigned for "these last do not sufficiently account for the same and the Commissioners are of opinion that the "sanitary condition of the city will be considerably improved by better supervision by the Sanitary "Department." That there are great insanitary defects still existing in Madras admits of little doubt, and until these have been remedied there can be no great improvement, but the Commissioners do not seem to realise that, even when they have been remedied, considerable fluctuations must still be anticipated in the public health from year to year. General unhealthy influences manifest themselves in one year and even in several years in succession, and are comparatively inactive at other periods. Local sanitary improvements which mean the removal of all local causes of diseases are also, without doubt, the best preservative against such general unwholesome influences, but they can by no means altogether control them, and so it will happen even in the most perfect sanitary conditions that can be created that one year will be distinguished by its healthy and another by its unhealthy character. It is well that this should be thoroughly understood, because, although sanitation can do much, it cannot accomplish impossibilities. The Madras Presidency and, in fact, the greater part of India, has been passing through a period of great sickness and mortality, and the city of Madras has suffered in common with other places. What the general causes were which produced these

unfortunate results we do not pretend to explain, but they were certainly connected with peculiarities of season which brought evils in their train, of which by no means the least was the high price of provisions and consequent distress among the people.

2. *Sanitary Works.*—The Report itself is written by the President of the Municipality, Lieutenant-Colonel Moore, and it embodies as usual information on all public health matters. It is clear and concise, and contains much interesting matter. We shall consider the various items in the order in which they are given, and the first is the progress made in sanitary works. The practical question which the Municipality has to deal with is the removal of all local causes of disease, and the most important part of the report ought to be that which records what progress is being made annually in this great work. Under this head the results of 1892–93 are disappointing. The amount spent was very small, and little therefore was done. It is right, however, to state that an expert (Mr. Cousins) had been deputed to investigate and report on the drainage and water-supply of Madras and that his recommendations had not been received before the year closed. The Commissioners continued to give much attention to the conservancy of the city and had carried out arrangements the good effects of which were soon expected to appear. Among these may be mentioned the more efficient removal of night soil from certain divisions where hitherto this had been imperfectly effected.

3. *Vaccination and Small-pox.*—The next point to which we need refer is vaccination, and the facts here recorded are very satisfactory. The number of operations performed, though somewhat less than that of the previous year, was large; the proportion of infants protected in relation to the number of births and the percentage of success attained are all evidence of good work, more especially as the figures have been tested to a large extent by inspection. The amount of success claimed in primary cases, 99·57 per cent., seems almost too good, and 96·57 in re-vaccinations is difficult to understand. But the most valuable evidence of the amount of good done by vaccination in the city of Madras is to be found in the marked diminution of small-pox. During 1892 only 21 deaths are reported to have been caused by this disease, though there is a slight discrepancy here, as the number given in the Tabular Statements, pp. 209 and 53, is 27. Both numbers, however, are very small, and a low mortality from small-pox has now been secured for a number of years. We have already referred to these satisfactory results in our Memorandum on the Sanitary Report of the Madras Presidency for 1892 as a very striking illustration of the decided diminution of small-pox under the protection afforded by successful vaccination. Fluctuations will occur even with small-pox. In spite of vaccination there will be years of minima and maxima, but so long as vaccination is carefully conducted the range between the two will be comparatively trifling.

4. *Registration of Births and Deaths in relation to the Censuses.*—A comparison of the censuses of 1881 and 1891 with the births and deaths recorded during the intervening period discloses that while the Census of 1891 showed an increase of 46,670 in the population, the excess of births over deaths registered during the 10 years amounted to only 354. The Commissioner attributes the discrepancy in part to immigration and partly to the fact that may of the women of Madras go to the country for their confinement, and that in this way many of the births which really belong to the city are not entered, but it seems probable that births escape registration through neglect. In the city of Madras there is no paucity of women such as there is in both Calcutta and Bombay to account for a low birth-rate, on the contrary the females are in excess of the males. Although, therefore, 36·8, the rate for Madras in 1892, is high when compared with that of European countries, it seems to be below the normal rate for India. Not only is there a general excess of females in the total population of Madras city, but this excess is observable in all but five of the 17 age periods in which it is divided. The female excess is also well marked during the chief child-bearing time of life from 15 to 35.

5. *Registration during* 1892. *Births.*—The diminution in the number of births in 1892 is attributed with every show of reason to the unfavourable circumstances of the previous year—the scarcity which prevailed, as well as the unusual amount of sickness, all of which tended materially to lessen the reproductive power of the people. The birth-rate of 36·8, which is the average for the city, is 3·1 per 1,000 less than it was in 1891, and 2 per 1,000 less than in 1890, but we observe that it is higher than in any of the years preceding that. If, therefore, the circumstances of 1892 were unfavourable to births as they no doubt were, it follows that the returns for the years anterior to 1890 are indicative of imperfections in the registration. The results for 1892 recorded for the different divisions of the city do not represent such marked contrasts as are observed in other registering circles throughout India. The general average (36·8) is made up of rates between 30·6 and 49·9, and the proportion of male to female births, which as a whole equals 105·3 per cent., fluctuates in its several parts between 102 and 111.

6. *Deaths.*—Although the death-rate was reduced from 5·26 per 1,000 in 1891, the rate for 1892 was still unusually high. In the monthly distribution of the deaths in two years there is a remarkable contrast, for whereas the early part of 1891 was comparatively healthy, the early months of 1892 were the reverse. The deaths of 1891 were chiefly in the later months, but in the later months of 1892 they were much fewer than they had been in the same months of the year previous. In both years the local surroundings as regards sanitation were much the same as usual, and the price of labour was unchanged, but there was one decided difference between them and many previous years, and that was the high price of provisions. This is a factor in its relation to the public health, which, as we have frequently remarked, is often made too little of in the sanitary history of the year, and yet it is one the influence of which is great. The Commissioner is fully alive to this. He says "prolonged want, due to the continued high price of food, was the principal predisposing cause of the high mortality among the masses," and this conclusion is fully borne out by the quotations which show that the principal articles of food, rice and ragi, were selling throughout the year, and more particularly

during the early months of the year, at rates far in excess of what they ordinarily were. However perfect other conditions may be, a population that is ill-nourishsd must be subject to great and severe sickness.

7. *Deaths by Sex and Age.*—There was no great difference in the death-rates according to sex, the proportion of deaths being in that of 92·5 males to every 100 females, a remarkable contrast to Bombay, where, according to the returns, the female death-rate was double that among males. The very high mortality among infants in Madras has long attracted attention. In 1890 this was recorded as 579·7 per 1,000; in 1891 it was 427·5; in 1892 it was 373·3. The figures seem hardly trustworthy, for they do not accord with the general results of the years in question. The year 1892 was a less healthy year than 1890, and yet the infantile death-rate was only 373 compared with 579, a fall of more than 200 per 1,000. Even although all the deaths may be registered, no great reliance can be placed on the ages recorded. As the result of his inquiries into the great loss of life among young children in Madras, the Commissioner believes that it is due to insanitary surroundings, malpractice of midwives, want of care on the part of the parents, and want of proper medical treatment during sickness.

8. *Deaths according to Diseases.*—Among the great heads of disease under which the mortality is registered the most noteworthy is fevers. In 1891 the deaths recorded under this head reached the unprecedented number of 6,731, the highest number of any of the previous 10 years having been 4,685 in 1890. In 1892 the fever deaths have exceeded the previous maximum of 1891 and reached 6,889. The figures of fever mortality show a decided tendency for such diseases to increase of late years. In 1888, which returns the minimum of the 11 years, the fever deaths were 3,372, or not much more than half of the total for 1892. There is always greater or less uncertainty as to the proportion of the total mortality which ought to be attributed to fevers, that is, to malarial fevers, for these are what the term evidently was intended to include; but when the increase of fever deaths is attended, as it is in this instance, with increase of those under all the other heads, or all the others except cholera and small-pox, the greater prevalence of severe malarial disease may be accepted as a fact. The Commissioner accepts this fact for 1892 and the year previous, and would account for it by the polluted state of the ground, arising among other causes from inadequate drainage, from insufficiency of food and clothing, the overcrowding of houses, and want of ventilation. As already mentioned, the Municipal Commissioners are not satisfied with this explanation; but it is difficult to imagine a complication of circumstances more unfavourable to health, and when in addition to these there is superadded the unknown epidemic influence which cannot be explained, but which was present beyond all manner of doubt, as indicated not only by the experience of the city of Madras but also by that of the Madras Presidency generally, and of nearly the whole of India in 1892, the causes assigned seem very ample.

9. *Deaths according to Localities.*—According to locality the deaths during the year varied between 38·5 and 54·1 per 1,000. The Commissioner observes a distinct relation between the death-rate and overcrowding in the divisional area, and also in individual houses. The results seem to be in great measure affected by the number of young children in the population. As we have already said, no great reliance can be placed on the exact ages of those whose deaths are registered, but if we take all those returned as under one year, and add those between one year and five years, the materials for doing which are to be found in the statement on page 228, we accept the total of the two as fairly representing the proportion of young children in each division, and if we compare these totals with the death-rates we find that there is a decided concurrence between the two. In the 2nd Division, for example, which registered the maximum mortality (54·1), there was the greatest proportion of young children (589·2 per 1,000), whereas in the 8th Division with the minimum mortality (38·5) the proportion of young children was smallest (348·5). In fact, with the one exception of the 3rd Division a relatively high proportion of young children and high death-rate go together in all the divisions. It is mentioned as a remarkable fact that the 2nd and 3rd Divisions, where the mortality was greatest, are the best drained and sewered; but when it is nevertheless added that in consequence of insufficiency of the sewers "there is an escape into the subsoil around them," and that the condition of the subsoil water in this part of the town is very bad, there can be little surprise at the heavy death-rate recorded.

10. *Sanitary Defects.*—A very dark picture is given of the insanitary conditions of Madras. These are discussed under ten separate heads. Some of them, such as the risk of "infection by sea," are of very minor importance, and any expenditure on means for meeting such a supposed danger, would, we believe, be to divert funds from much more necessary purposes. It is quite impossible to keep up a surveillance over the number of people who go into Madras city by land, and it would therefore be idle to attempt anything of the kind over the few coming by sea. The great dangers to health in Madras are the pollution of the soil, the insufficient quantity and inferior quality of the water-supply, and the want of proper drainage. On this head the Commissioner writes, "The want of proper "drains and sewers to carry off the large amount of refuse water from the various domestic operations "of nearly half-a-million people is the greatest sanitary requirement of the town." It would seem from this that under a new system of drainage it was contemplated still to continue the removal of the night-soil by hand. The report of the expert must be awaited, and until it is submitted it would be unprofitable, as the Government of Madras remark, to make any detailed observations on the subject. We trust, however, that before these plans are fully decided on, the great question of the proper mode of removing the night-soil of the city may be carefully considered if, with the introduction of proper sewers, there should be any thought of continuing the present expensive and unsatisfactory system.

19th July 1894.

No. 15.

Memorandum by the Army Sanitary Commission on the Administration Report of the Municipal Commissioner of Bombay for 1892–93.

1. *General Causes of Unhealthiness.*—The year was very unhealthy—cholera, small-pox, and fevers in particular were prevalent. The total mortality, 32·26, was high and under each of the above heads it showed a considerable increase over the ratio of the previous four years, with which detailed comparison is made. The Health Officer remarks that in the experience of the city of Bombay an abnormal season is always attended with increased sickness and mortality. In 1892, "with a higher temperature, and a higher dew point, there was a higher mortality." The year 1891 had been memorable for a severe drought, and though this was not followed by actual famine in the western Presidency, it was certainly productive of scarcity and high prices, which had their influence on the food of the people, and were therefore adverse to health. On this important question of food-supply we have found no reference in this report, but as we have already seen in the report of the Sanitary Commissioner of the province food was dear, and to the inhabitants of India any such rise is a matter of much consequence. It is very desirable that in future reports this potent factor should not be left unnoticed. Whatever the general causes of unhealthiness may have been, and how much of the result is to be attributed to each, there can be no question that they did exist, and that they were widely operative over India in 1892. In the Bombay Presidency the year was eminently unhealthy, and if we confine our attention to the districts immediately beside the city the same fact comes out. In both the districts of Thana and Colaba the mortality was unusually high, just as it was in the city, and there was a remarkable prevalence of disease, more especially of fever. There can be little doubt then that Bombay city was suffering from some great general cause or causes which affected a large area.

2. *Local Causes of Unhealthiness.*—But such general causes are as yet obscure and beyond our power to deal with. It is with the local causes of disease that sanitary work has to do, and of these two very serious ones are mentioned as having militated against the health of Bombay city during 1892. They were insufficient drainage and pollution of the ground. The first of them is due to the enormous increase of the water-supply. Compared with that year it has almost doubled, the daily delivery having risen from 16½ to 29 millions of gallons, while there has been little increase in the number of drains. "In more than one-half of the island" it is said, "there are not drains." The soil pollution is being caused by the stagnation and flowing back of sewage, because the pumping power has been insufficient to empty the sewers. In illustration of the ill-effects which are arising from such a state of things the cases of the two Nagpada sections of the city are cited, and mention is afterwards made of dangers to health existing in other quarters distinguished by high death-rates In the 1st Nagpada the mortality of 1892 was 40·15, and in the 2nd it was 44·49. The Health Officer refers generally to districts without drainage, on which more than 60 gallons of water per head of population are delivered daily, and which are becoming in consequence polluted and unhealthy. We would suggest that these local conditions should be dealt with more in detail, so as to compare them with the resulting mortality. A statement prepared on the same principle as that adopted in the reports of the Provincial Sanitary Commissioners for setting side by side the death-rates in towns and villages with the description of their state as respects water-supply, drainage, and conservancy, would be most useful, the place of the towns and villages being taken by the various sections of the city of Bombay. The great object is to localise the causes of disease in every one of the sections, to show by the mortuary and other statistics the ill-effects which are arising from such causes, and also the benefits which are derived according to these causes are either altogether removed or partially remedied. This can be done fully only by taking every section of the city and comparing the state in which it is year after year with the deaths recorded in that year. Besides imperfect drainage and soil pollution, there are other evils to be recorded in such an annual history, and among these the overcrowding of ill-ventilated buildings is regarded as one of the most serious affecting Bombay.

3. *Vital Statistics. Births.*—The births were almost exactly in the same number as they were in 1891, the ratio having been 18·84 compared with 18·88. A low birth-rate is a natural consequence of the small proportion of females to males. According to the Census of 1891 the males in the city of Bombay numbered 518,093, while the females were only 303,671. The report states that the birth-rate by classes is evidence that the registration is not very imperfect, because "it bears a direct ratio to the number of females in each community." It would be interesting to have this worked out in detail, taking either communities by classes, as referred to in this quotation, or by localities as tabulated on page 417A, the object being to compare the birth-rate per 1,000 in each of them with the percentage of females in the population concerned. A comparison by localities would be more useful for practical purposes, as it could be more easily employed for the detection of any neglect in registration than a comparison of classes which are spread, more or less, over all the sections of the city. It would also be interesting to know what steps are taken to supervise the registration and check the returns, a measure very useful in itself, and highly important for the proper work of the vaccinators. The statement at page 417, which contains the results of birth registration from 1866 to 1892, shows that the annual number of births recorded has varied between 3,140 in 1870 and 17,247 in 1880. During the succeeding 12 years the range has been between 14,637 and 16,760. It would seem that, especially in the earlier years, registration of births was much neglected, and it would be

satisfactory to have detailed evidence, both by careful analysis of the results, and a full account of the means by which these results are obtained, that the annual records are now fairly accurate.

4. *Deaths according to Sex.*—The very great mortality among females as compared with male which has been observed in former years was seen again in 1892. The female death-rate (42·42) was in fact very nearly double the male death-rate (26·31). The reasons assigning this extraordinary contrast to the special dangers of child bearing are altogether insufficient. It is quite true that there is an excess of deaths among females during the child-bearing period, say from 15 to 40 years of age, but the statement on page 389 shows that the excess is not confined to that period, and that it is almost equally striking at other times of life. Of the 16 periods given in the statement there are only three in which the male mortality exceeds the female mortality. In the period from 10 to 14 years of age, for example, the male mortality is entered as 6·02 while the female mortality is 14·71 or more than double. As we said in last year's memorandum, further inquiry on the excessive mortality among females is much required.

5. *Deaths according to Place of Birth.*—Attention is drawn in the Report to the large number of deaths in persons who had been born elsewhere than in Bombay. It was in fact among them that the increased death-rate of 1892 chiefly occurred. The large number of deaths which occur among persons born elsewhere is an annually recurring incident to a greater or less degree in the Bombay statistics; but in 1892 it was more marked than usual, and that too chiefly in the earlier months of the year. The cause it may be assumed was the fact that owing to hard times many persons were driven to the city, and that many of these again were suffering from the effects of privation. The statistics regarding strangers would be much more valuable if some idea were given of the length of time these strangers had been resident in Bombay before they died.

Periods of,—Under 1 month,
Above 1 and under 3 months,
Above 3 and under 6 months,
Above 6 months and under 1 year,

and above 1 year, would be ample to show how far the deaths ought in all probability to be ascribed to causes which had been at work before they came to Bombay.

6. *Deaths according to Causes.*—Arranged under the general headings which are followed in the Provincial Sanitary Reports the deaths for 1892 stand thus per 1,000 of population :—

Cholera	·21
Small-pox	·66
Fevers	10·29
Dysentery and Diarrhœa	2·22
Injuries	·48
All other causes	18·40
Total	32·26

If we turn to page 40 of the General Report, where more detailed comparison is made of the deaths of 1892 with those of the four previous years, we find the mortality under small-pox, measles, fevers, phthisis, respiratory diseases, and diarrhœa was higher than in any of these years.

7. *Small-pox and Vaccination.*—Other diseases do not call for special remark, but in regard to small-pox we may observe that the results are by no means so satisfactory as they are in the town of Madras. There, according to the Report of the Sanitary Commissioner of that Presidency, the small-pox mortality since 1884 has never exceeded ·2 per 1,000, and has frequently been much under that. The actual annual number of deaths caused by small-pox in Madras during that period has ranged between 1 in 1886 and 72 in 1890, but in Bombay during the last five years the minimum has been 150 in 1890 and 541 in 1892. The contrast is very unfavourable to Bombay. The only information regarding vaccination in Bombay during 1892 is contained in a tabular statement at page 398 from which it appears that 16,056 infants under one year were successfully operated on during 1892, the total number of births registered during the year having been only 15,485, so that the births of the city were fully overtaken. Under deaths at different ages (page 468) we observe that 78 of the deaths from small-pox occurred among infants under one year, which is by no means satisfactory. On page 397 again we have small-pox deaths according to locality, and observe that in one of the sections the rate was 2·22 per 1,000, the equivalent of 64 fatal cases. More information regarding vaccination would be useful, and its relation to small-pox mortality in the different sections of the city.

8. *Deaths according to Locality.*—The variations in the sectional death-rates which compose the general average of 32·26 for the city as a whole are certainly very remarkable They range between 2·66 in the Water Division and 47·59 in Parel. It is to be assumed that the inhabitants of the water division go elsewhere to die for there seems no other way of explaining the annually recurring low mortality in this section. In Parel and other parts where a high-death rate is recorded, the Health Officer calls attention to insanitary conditions of bad drainage and sewerage already referred to. How real is the want of drainage in parts is strikingly illustrated by the experiences of a member of the Corporation who come to live in Kansathipura, where the mortality was 46·15, and saw "to his amazement the water rising up through the floor of his house."

9. *Sanitary Works.*—There can be little doubt that the description of the Health Officer represent a very serious state of things and there seems to be no reason for thinking that this description is in any way exaggerated. What steps were being taken to remedy the evils complained of? Under the head of drainage two suggestions were made. The first was, that more powerful engines should be provided at Love Grove to pump up the sewage which had been so largely increased in volume by the opening of the Tansa waterworks. This has been acted on. The other was that in order to prevent the saturation of the soil which was taking place, the amount of water delivered in those districts which had insufficient drainage should be reduced to one-third of that which had of late been allowed, and that in those districts where there were no drains at all the amount should be still further curtailed. It does not appear what action, if any, was taken on this last suggestion. The Corporation had agreed to provide an engine for flushing the gullies in the most crowded parts of the city. More latrines and urinals had been erected, and a committee was considering the best kind of fittings for house connections before any further work was done in this direction. Under the head of drainage, in addition to other improvements of a minor kind, it is noted that Rs. 7,09,608 had been sanctioned for the sewerage of Colaba on the Shone system, and that the project was being proceeded with. The water supply was superabundant; with a heavy rainfall the lakes all overflowed and a large surplus ran to waste.

19th July 1894.

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